35th YEAR OF PUBLICATION

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Chemical Weekly

VOL. XXXV OCTOBER 3. 1989 NO 4

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CHEMICAL WEEKLY

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HERALDING THE 21st CENTURY - 28 (a)

Medical Challenges: Can we manufacture (grow) human skin?

Our skin is the emblem of our humanity. Our image of the human body is laregly defined by what we can see in in the mirror, and what we can touch with our hands. The skin, of course, routinely monitors the outside temperature and reports any changes to the brain. But the busy hot line between the skin and brain carries messages about more than just temperature. We can count on it to let us know what is wet or dry, hard or soft, rough or smooth.

To do all its jobs, the skin is crowded with receiving and sending apparatus. To begin with, it is everywhere faced with naked nerve endings, more in some places than in others. The sensitive parts of the hand contain more than 200 in a square centimetre. Additional nerves are modified with bulbs and corpuscles to make them specifically sensitive to heat, cold, pain and pressure. Discoveries over the past few years have forced us to acknowledge how astonishingly little we have understood about this convoluted body stocking we wear so casually. Our skin does things for us we never dreamed of. Today we are right in the middle of what could justly be called a dermatological renaissance.

The surface area of the average human body is rougly 1.5 square meters. The skin's first fit is around such places as the scalp, the ears, the palms of the hands and the soles of the feet. It is looser elsewhere, with a generous amount of give around the abdomen, for instance, and is pleated for flexibility around the nuckles, knees and elbows. It weighs somewhere in the neighbourhood of four kilograms, depending on the size and heft of the original owner.

The techniques of biochemistry and molecular biology are what brought skin research forward from simple microscopic inspection to today's dermatological renaissance. We now know that the skin is both a key element in the immune system and a chemical conversion factory that rivals the liver. This later activity, the bio-transformation of chemical compounds is known as cutaneous pharmacology. Take cortisone, for example. It is anti-inflammatory, and it makes sense to apply it to inflamed skin -- but cortisone itself would have no effect. What happens is that the skin changes it to hydrocortisone, which does work. The skin can modify all kinds of compounds that come into contact with it. A virulent, cancer-causing chemical can land on the skin and, as it begins to penetrate, epidermal enzymes simply break it down into harmless constituents.

One of the skin's most unwelcome surprises is that its biotransformations do not invariably detoxify. In some instances the skin's enzymes latch onto an innocuous compound and transform it into a carcinogen! Benzopyrene, a hydrocarbon produced during the incomplete combustion of coal and heavy fuel oil, is among the more notorious of environmental carcinogens. Yet it would be harmless were it not for the presence in the epidermis of an enzyme that converts it to a sinister byproduct that penetrates cells and modifies their DNA (deoxyribonucleic acid) causing them to become cancerous. The skin's immune functions turn out to be related in many ways to its metabolic capacities. In both, enzymes often make the critical difference. The well-known poison ivy rash, for example is an allergic reaction -- or, in different language, an immune response. The body is defending itself against a threat.

Most striking of all is the recent discovery that the cells on the surface of our skin, once thought to be a purely passive defense against the outside, play a major role in the functioning of the immune system. The surface cells are called keratinocycles because they produce keratin, a protein whose molecules link together closely to form a tough, pliable, waterproof membrane covering our bodies. By the time these cells die, they are composed almost entirely of keratin. (It is also the stuff of our hair and nails and the horns, hoofs, and claws of other animals).

The improved process (*H.P.*, April-89) which achieves a shift in the equilibrium uses a special catalyst which consists of active metal oxides on a carrier. The conversion of H_2S to S is higher than 85% and not upset by excess air. It is also not sensitive to high water of reaction and formation of COS and CS_2 is also avoided. The process consists of the thermal stage as usual followed by 3 or 4 catalyst reactor stages to form sulfur. The first three have Standard Claus catalyst and the last has the new special catalyst. Operation is with excess H_2O which suppresses SO_2 conversion in tail gas after the 2nd reactor stage and the remaining H_2S is oxidised with air over the new catalyst. Part of the air is diverted to this special reactor. The thermal stage oxidation is controlled with sub-stoichiometric amount of air, so that the tail gas from second reactor has 0.8 to 3.0% of H_2S which is selectively oxidised in the new catalyst reactor. There is also a hydrogenation stage before this oxidation reactor where other sulfur conpounds get converted to H_2S.

The typical results of the conventional and Superclaus processes are reported as under.

TYPICAL SULFUR RECOVERIES

	Claus, 2 stages	Superclaus 99, 2 stages + sel. oxidation	Superclaus 99.5, 2 stage + hydrogena tion + sel. oxidation
Air to Claus, %	100.0	96.2	100.0
After 2 Claus stages or hydrogenation stage			
Conversion to S, %	96.7	95.7	96.7
Resulting H_2S, %	2.2	4.0	3.3
Resulting SO_2, %	1.1	0.3	0
S from sel. oxidation, %		3.6	2.9
S vapour losses, %	0.2	0.2	0.2
Total S recovery, %	96.5	99.1	99.4

The process can be used for revamping existing Claus units. It was developed by Comprimo BV and the first 100 tpd unit is operating successfully.

The horse starts galloping

Kudremukh or the horse face has been a great disappointment for several years. This project for beneficiated iron ore from Kudremukh hills, mined, ground, transported as slurry by pipeline over the Western Ghat and processed for export to Iran of 7.5 million tonnes a year over a period 20 years, was a great challenge. It was financed by Iran in the grand days of the Shah and completed on a tight schedule only to find that the Shah regime was overthrown and Iran was in turmoil and unable to lift any ore for processing to steel, using the plentiful natural gas available. The product had no other buyers and the Kudremukh Iron Ore Company has been languishing for several years with attempts to find buyers. But the decision to pelletise the ore as a solution to the marketing problems has been the right one -- I believe with Rumanian know-how. The market for iron ore pellets has picked up and buyers are from several countries so that tie up with a sole buyer is avoided. The exports last year were Rs. 116 crores, a sixth of total iron ore exports and — the target is a happy Rs. 200 crores for this year. The programme is now for expansion to 10 million tonnes a year at a cost of Rs. 400 croes, to be followed by a sponge-iron plant if possible.

There have been extensive discussion on the repayments to Iran of loans for this project ($ 630 million) but it is reported to have been sorted out and a new export programme of 25 million tonnes over 15 years to Iran is also expected. So after several years of disability the horse has started to gallop.

Himont's Catalloy polymers

Himont -- joint undertaking of Montedison and Hercules, specialising in polypropylene production and licensing of the technology for it -- has now come up with a new development for polyolefins under the name 'Catalloy'. Himont have already broken new ground with their speripol process for polypropylene and the new catalyst system is aimed at a wide range of copolymers or polymer alloys from olefins.

The catalyst system is said to be of multiple components of undisclosed composition and the objective is to make a wide range of elastomers based on ethylene/propylene and of engineering resins. A plant of 80,000 tonnes capacity is under construction and will concentrate on ethylene polymers with comonomers -- in the high density and linear low density range.

There is no intention to license this catalloy system to others at present. Himont expects to extend the catalyst system for other polymerisations including alpha olefines, methyl methacrylate and styrene in due course.

Daurala Sugar plans two units in UP

Daurala Sugar Works, a unit of DCM Ltd., is investing Rs. 29 crores in two projects for making acetic acid, butanol, alpha phenyl glycine and its chloride hydrochloride. Government approval for the two projects has just been received. Both the projects are to be set up in Uttar Pradesh.

According to official sources, the acetic acid project involves an investment of Rs. 14 crores. The proposal envisages the production of 6,000 tonnes per annum (TPA) of acetic acid and 5,000 TPA of butanol and butanol derivatives at the existing unit located at Daurala Sugar Works, Daural, district Meerut, UP.

The other project, with an investment of Rs. 15 crores, relates to the production of 500 TPA of D-alpha phenyl glycine and its chloride hydrochloride and dane salts. This unit too will come up at the company's existing location. The company plans to raise funds for the project through debentures (Rs. 5 crores), loans from financial institutions (Rs. 5 crores) and the balance from internal resources.

The company had informed the government that the proposed products are used for making semi-synthetic penicillin (ampicillin) and cephalosporins, important antibiotics. At present, these items are not manufactured in the country and the entire indigenous requirement is met through imports.

In the case of the acetic acid and butanol project, the company has given an undertaking that it would not produce the items reserved for the small scale sector, especially di-butyl phthalate or any other butanol derivative. Out of the total cost of Rs. 14 crores, the company proposes to raise Rs. 4.67 crores through financial institutions, Rs. 4.66 crores through internal accruals and the balance by way of debentures on rights basis.

In the case of the two projects, the government has told the company that it cannot assume any commitment from the financial institutions and banks for funding, either for the whole or part of the projects. Loans sanctioned by them would be subject to the terms and conditions including appropriate debt-equity ratio and conversion option, as may be acceptable to them.

Similarly, the import of capital goods and means of financing would be subject to the approval of the government. More important, the company would be required to take adequate steps to the satisfaction of the government to prevent air, water and soil pollution. The anti-pollution measures to be taken, would have to conform to the effluent and emission standards prescribed by the state government in which the factory is located.

INDIA POISED TO EXPORT SODA ASH

There is scope to boost soda ash export as two of the major producers, the U.S. and China, have to cut output because of the floods in the main producing areas in the former country and political disturbances in the latter.

India can earn about Rs. 34 crores in foreign exchange even if it exports one lakh tonnes of the commodity per year, according to Mr. Y.K. Jain, Managing Director, Gujarat Heavy Chemicals Ltd., (GHCL), the Rs. 287 crore unit promoted by Gujarat Industrial Investment Corporation (GIIC) in the joint sector with Dalmias.

The company attained 90 per cent production capacity and had a capacity to make four lakh tonnes per annum while the Tata unit, largest in the country, had a capacity of 6.25 lakh tonnes.

The country was now self-sufficient in this product and even considering annual growth of consumption by 13.5 per cent, shortage in the near future was unlikely especially when GHCL was planning to instal another stream to raise its capacity by 1.2 lakh tonnes per annum.

GHCL which had tie-up with Akzo Zout Chemie of Holland produced both light and dense varieties. The dense variety was increasingly used by the glass industry. With the building boom and preference for glass as an exterior in countries like the U.S., Canada and Hong Kong, India could earn substantial forex. However the main stumbling block to exports was the Government's unwillingness to give CCS and other export incentives to the soda ash industry.

Mr. Jain felt the Government must have taken this decision when export of soda ash was not feasible but now a time had come for policy revision especially in the context of crunch in forex the country was facing.

Talking about his company, he said apart from attaining 90 per cent production capacity, the company was making cash profits which had gone up to about Rs. 2 crores in August. Looking to the quality of soda ash and the capacity utilisation, the company would start making net profit in a couple of months. The cost of manufacturing soda ash by the company was the lowest compared to the industry's average manufacturing cost. The company was expected to wipe out its accumulated losses in 1990-91 and pay dividend for the year ending March 31, 1992.

The company could sell its entire production since commencement and there were no quality complaints whatsoever. It started meeting needs of small consumers as well by offering smaller packages. The company would spend Rs. 80 crores on its third stream. However it would consider entering capital market only after paying maiden dividend, Mr. Jain added.

MANUFACTURE OF PENICILLIN G

SPIC setting up Rs. 45-crore project at Cuddalore

The Madras-based Southern Petrochemicals Corporation Limited (SPIC) is setting up a Rs. 45-crore project for the manufacture of penicillin 'G' at Cuddalore, Tamil Nadu. Government approval for the project has just been received.

According to official sources, the company, which belongs to the M.A. Chidambaram group of industries, proposes to produce 1000 mmu of penicillin 'G'. The approval is conditional to the fact that the company should establish a strong research and development back-up with at least 80 per cent recovery efficiency.

The sources said that the company proposes to raise funds for the project through the issue of equity capital, preference capital and debentures and by raising loans from financial institutions. In addition, it plans to raise foreign currency loans. The government approval to the company's proposal follows the view that there is enough scope for the creation of further capacity in the proposed line of manufacture. Similarly, this item is covered under Appendix-I to the industrial policy and the large industrial houses are normally entitled to enter this area.

Of the total cost, the company proposes to raise Rs. 11.25 crores through internal generation and equity capital on rights basis, Rs. 6.4 crores through foreign exchange loans, Rs. 13.67 crores as loan from financial institutions and banks and the balance by way of debentures. The government has, however, stipulated that the company should not assume any commitment from the financial institutions and banks for financing the project, either fully or partially. Loans sanctioned by the financial institutions, the government has said, would be subject to the terms and conditions, including appropriate debt equity ratio and conversion option, as may be acceptable to them.

Another condition is that the company should necessarily install full capacity of 1000 mmu to achieve economies of scale besides keeping the price at a reasonable level. Of equal importance is the condition that the company should commit, both to the Central and the state government, that it would install appropriate equipment for the prevention and control of pollution. In addition, it will have to obtain a certificate from the concerned state pollution control board that the proposal meets the environmental requirements and that the equipment installed or proposed to be installed, is adequate and appropriate to the requirements.

VIJAIPUR PETROCHEM COMPLEX: GAIL SELECTS US, ITALIAN COMPANIES

The Gas Authority of India Limited (GAIL) has selected UOP of United States and Tecnimont of Italy as process licensors for the Rs. 730-crore petrochemical complex being set up by it at Vijaipur in Madhya Pradesh. The US company has been selected for the propane dehydrogenation plant and the Italian company for polypropylene manufacture. Memoranda of understanding have been signed by GAIL with two companies and the preparation of process design packages has started.

GAIL has already taken up the work of implementing the LPG recovery project at Vijaipur. The project will process 15 million cubic metres of gas per day from the HBJ gas pipeline and recover over four lakh tonnes per annum of LPG.

The petrochemical project is designed to maximise the economic benefit of the gas being transported through the HBJ gas pipeline by recovering 1.30 lakh tonnes per annum of propane at Vijaipur. The recovered propane will be dehydrogenated to obtain propylene which is to be used to manufacture petrochemicals.

The polypropylene will have a capacity of one lakh tonnes per annum. The foundation stone of the petrochemical complex will be laid by the Prime Miniter, Mr. Rajiv Gandhi, and the project is scheduled to be completed in 36 months time.

The pre-Public Investment Board note to set up the plant for manufacture of polypropylene in the joint sector at Vijaipur was submitted by GAIL in August 1987. The first stage clearance from the board for preparation of the detailed feasibility report was given to GAIL in January 1988. However, in March 1989, the government entrusted the job of setting up the plant entirely to GAIL and the joint sector concept was given up.

A detailed financial and economic analysis has been made by GAIL in deciding on propylene and polypropylene. The propylene will be converted into different grades of polypropylene. It is envisaged that initially the project will produce only homopolymers. However, it will have the flexibility to produce impact co-polymers in future by installation of an additional reactor. According to one estimate, about 5,000 tonnes per annum of propylene will be surplus.

Polypropylene polymers have a variety of uses in household and consumer appliances, textile industry, chemical industry, automobiles, pharmaceuticals and packaging industry. The demand for polypropylene in India is estimated at 2.86 lakh tonnes per annum in 1994-95 and 4.20 lakh tonnes per annum in 2000 AD. Against this, the available capacity is likely to be 1.45 tonnes per annum by 1992-93.

INTENDED PROFITS OF DRUG COMPANIES

Another recovery move initiated

The Department of Chemicals and rochemicals is making yet another empt to recover "unintended profits" nounting to several crores of rupees sumed to have been made by the drug mpanies from April 1979 to August 87. The recovery move is as per the ovisions of the Drug Price Control rder of 1979. Drug Price Equalisation ccount (DPEA), to which the recov-ed amount should go, has however en abolished under the Drug Price ontrol Order 1987.

The department is reported to have nt notices to at least 300 drug com-nies seeking classified information lating to the procurement price and ilisation of various bulk drugs. Sim-ar notices had been sent by the epartment some time in September 986 to these drug companies but very w companies had responded then.

Details of procurement of both nported and indigenous bulk drugs ere called by the department from the rug companies then also. No action as taken against the drug companies r not supplying the information until ow. This time the department has how-ver threatened the drug companies of gal action under the provisions of PCO, 1987 and the Essential Com-odities Act if they failed to supply the quired information.

The department has pointed out that is the statutory obligation of the man-facturers to maintain records relating procurement, price of procurement nd utilisation of various bulk drugs and roduce such records for inspection as nd when required by the government. ndustry sources at Bombay said that it as impossible to preserve and produce ecords of procurement and other inute details for a period of 10 years.

Not a single unit will be able to pro-uce batch-wise information of formu-tions produced with the bulk drugs rocured 10 years ago as asked by the department. Usually such records are not maintained after four years by any manufacturing concern. The sources said that it would be wrong to assume that drug units have made any unintended profits during the period of 1979-1987 when most of the drug units were actually incurring losses.

If at all in certain cases the drug units were benefited because of a price drop of a few bulk drugs for a short period they also incurred unintended losses when the prices of bulk drugs had gone up. In many such cases the government had revised the prices only after several months, the sources pointed out.

DRUGS EXPORTS CAN TOUCH Rs. 10,000 CRORE

The pharmaceutical industry's exports can touch the Rs. 10,000-crore mark by the end of the Eighth Plan if rules are simplified and the climate for fresh investments made more conducive, according to Mr. N.I. Gandhi, President of the Indian Drug Manufacturers' Association.

On a conservative estimate, this year's exports are likely to exceed Rs. 600 crores, showing a substantial increase over the last few years. If the cumbersome price approval mechanism is simplified, it would be possible for the manufacturers to concentrate more on increasing the domestic production and tap the export market which today is growing at a very fast pace, he said. In this connection, Mr. Gandhi welcomed the Government's move to simplify drug pricing procedures.

At present, price approvals take months after the application is submitted. By the time the approvals come, there is already a further increase in costs which at times lead to curtailment of production, the IDMA President said.

Tremendous scope for export of dyestuff

Export opportunities for the buoyant dyestuff industry have grown manifold following the stoppage of production by Nippon Kayaku, one of Japan's foremost dyestuff manufacturers.

Kayaku has been forced to cease operations following a fire, the third in recent times, and a vocal environmental lobby is opposed to its reopening. The Japanese Ministry of Industry and Trade (MITI) has directed other producers to cater to the local market and curtail exports. Kayaku has a 2,500 tonne capacity for disperse dyes alone.

Perhaps not coincidentally, Japan External Trade Organisation (JETRO) is sending a team of experts to India to interact with Indian producers on quality standards and technological improvements which Indian industry may need to cultivate the Japanese market. The visit is hosted by the Basic Chemicals, Pharmaceuticals and Cosmetics Exports Promotion Council (Chemexcil), which monitors dye exports.

Exports of dyes and dye intermediates are expected to cross the Rs. 500 crore mark this year. Chemexcil has fixed an ambitious target of Rs. 650 crores for the current year "which in all probability may be surpassed before the close of the financial year provided the material availability eases," according to its Chairman Mr. Ramu Deora.

Dyestuffs and intermediates are one of the fastest growing items in India's export basket, exports having risen from Rs. 214 crores in 1987-88 to Rs. 401 crores in 1988-89. Exports to Japan are in the range of Rs. 15 crores. According to Chemexcil, the Japanese market is worth Rs. 3,585 million and it is possible to capture at least 10 per cent of this market in the next couple of years.

Exports of chemicals also spurted from Rs. 92 crores last year to Rs. 149 crores during 1988-89. The star products in this segment are caustic soda (Rs. 7.34 crores), calcium dibasic phosphate (Rs. 3.44 crores), phthalic anhydride (Rs. 9.37 crores), ethyl alcohol (Rs. 7.26 crores) and pesticides (Rs. 64.25 crores).

Exports of cosmetics and toiletries increased from Rs. 85 crores in 1987-88 to Rs. 139 crores during the year, thanks to the Soviets. A delegation from USSR for purchase of consumer items is expected to arrive at Bombay shortly and future prospects appear to be bright thanks to the shortage of consumer goods and the liberalisation in the USSR.

Exports of bulk drugs and pharmaceutical formulations are also on t upswing. The council has identifi Australia and Indonesia as two maj potential markets and buyer-seller mee are to be held in February 1990. Als the eleventh international congress o essential oils, flavours and fragrances to be organised in Delhi in Novembe

Exports during 1988-89 amounted t Rs. 1,247 crores, 59 per cent higher tha Rs. 783 crores during the previous yea Mr. Deora is hopeful of surpassing thi year's target of Rs. 2,100 crores "by a least Rs. 400 crores." Though export have been surging with the council play ing a helpful role, major exporters fee that in serving 3,000-odd members, i spends a lot of its time which could oth erwise have been utilised in evolving strategies and in trying to assist the 20% members who net in the lion's share o exports.

PENNWALT INDIA BAGS Rs. 2 CRORE ORDER

Pennwalt India Limited, has bagged a Rs. 2 crore order for continuous edible oil refining plant from Gomati Sahakari Telbiya Prakriya Prakalp Limited.

According to the company's press release, the scope of the work includes detailed engineering, manufacturing, supply, erection and commission of the complete refining plant.

Drug industry urged to invest in R & D

The strides the Indian pharmaceutical industry has taken during the past 40 years in the post-independence era are commendable, but there is no room for complacency as even the primary health coverage in the country is yet to reach a point of desired intensification, Union Minister of State for Chemicals and Petrochemicals Mr. P. Namgyal said.

The per capita consumption of drugs in the country would increase with the economic development and therefore, the growth of the industry has to be accelerated further to meet the growing demands of the Indian public, Mr. Namgyal said inaugurating a national seminar 'on bulk drugs and pharmaceuticals — some new horizons' — organised by the Chemtech foundation at Pune.

The Union Minister said as we establish ourselves in the international market, there will be greater demands for exports as well and hence apart from the investment what India requires most is indigenous research and development. Since India has the third largest scientific and technical manpower in the world, there was no reason to lag behind he said adding that there was need for national laboratories, medical colleges and research divisions of various companies to make concerted and fuller utilisation of existing facilities.

Even though the production level was rising steadily from Rs. 10 crore at the time of Independence to about Rs. 3,700 crore today, there were many areas such as development of new molecule, quality consciousness and export promotion where India lagged behind, Mr. Namgyal said. Emphasising that there should not be any compromise as far as medicines were concerned, Mr. Namgyal called upon the manufacturers to follow the highest standards of quality so that the best could be made available to the ailing public.

Underlining the vital role that biotechnology could play in the health care industry in India in the immediate future, Dr. S. Ramachandran, Secretary in the Department of Biotechnology, Union Government, called upon the pharmaceuticals industry to come out with indigenously developed diagnostic kits.

Since the public health care system of India would require very large number of kits, indigenous research and development was necessary into the diagnostic kits rather than importing costly ones, Dr. Ramachandran stressed. Dr. Ramachandran said the biotechnology would make significant impact in increasing the production of antibiotics, certain vitamins and steroids, it would also give rise to introduction of several novel and improved vaccines for protection against viral and bacterial infections.

Dr. Ramachandran said as regards production of bioactive molecules by "R-DNA technology", which would help in understanding various expression system and also on methods of purification of therapeutic proteins from the cell group, it was doubtful if any plant could be set up in the country within another five to 10 years unless very concerted efforts were made and the area as vigorously pursued both by the industry and the institutions.

He said currently the biotechnology products including antibiotics by fermentation, vaccines, diagnostics blood products and improved sustained release pharmaceutical formulations cover a small portion of the market of the order of eight to nine per cent of the total pharmaceutical market.

It is however, anticipated that by the turn of the century, the share of biotechnology products would increase substantially and could go up to about 20 per cent of the turnover, he said and urged prospective entrepreneurs to enter and expand in the field so as to enable them capture a substantial share in the future.

DPCO EXEMPTION FOR NEW DELIVERY SYSTEM

The Government has exempted dr having the latest techniques of deliv system from the purview of the Dr Price Control Order of 1987. T exemption will be available for a per of five years only from the date approval by the Government.

The exemption for new delive system will be applicable only to ne cases and will not apply retrospective according to an official notificatio Anti-asthmatic drugs like salbutam pain killers like ibuprofen, and son anti-cardiac drugs which are using t new delivery system may be benefit by the exemption.

This price control exemption for ne delivery system was recommended b the Kelkar Committee of the Bureau o Industrial Costs and Prices, headed b its Chairman, Mr. Vijay Kelkar, in i report on drugs prices. The Kelka Committee has observed that the ne delivery systems ensures better effic ency and have lesser side effects. Thes techniques require lesser amount of tot dosages and also increases bio availability of the drugs.

The committee has noted that thes technologies are fairly of recent origi and in the western countries nearly 2 per cent of the new drug formulation have the new delivery system. Formu lations in these forms have so far bee used to a very small degree in India Being high technology intensive an needing substantial investments fo development, they need to be kept ou of price control, the committee has rec ommended.

The committee felt that unless thes technologies were adopted within th country and developed further, th people of the country will be deprive of their benefits.

SPARTAME PACKAGES

Changes proposed in statutory labelling

The Ministry of Health and Family elfare proposes to amend the statutory belling on aspartame packages, revivg the prospect of indigenous manufacre of this billion dollar turnover low lorie sugar substitute.

Aspartame (a discovery of GD Searle the US) is now being imported and arketed by companies like Cadila. A nthetic protein, aspartame is 180-200 mes sweeter than ordinary sugar ucrose). Since one has to use a small uantity of aspartame to achieve the weetening effect of sugar, it is a boon calorie watchers and diabetics. One ram of sugar contains four calories ompared to 0.4 calorie in aspartame.

The Indian affiliate of GD Searle, earle (India) Ltd. has been unable to mplement a letter of intent to manufacure aspartame because the notification n labelling virtually makes the product prescription drug. Nowhere in the orld is aspartame sold as a drug and D Searle does not want the Indian firm market its product as such.

The Department of Health notification of April 15, 1988, requires every ackage of aspartame marketed as weetener to carry the following warnng, "1. for diabetics only, 2. to be used n medical advice, 3. not to be used by regnant women, children or others aving symptoms of phenyl ketonuria." Unlike in the West, aspartame cannot be marketed as powder in dry mixes or in iquid systems in India.

Worldwide, the only warning incorporated on aspartame packages is the one regarding phenyl ketonuria (PKU). This is because PKU patients cannot break down phenylalanine, an essential amino acid required by the body for protein synthesis. PKU patients are also advised to restrict foods like skimmed milk which contains six times more phenylalanine than an equal volume of aspartame-sweetened beverage. Incidentally, only one in 30,000 in the West suffer from PKU. In India, only one in 60,000 has the disease, according to a study.

Except for the PKU restriction, all other restrictions are unwarranted, according to the company's representation to the Government. This is supported by a large number of scientific studies on the safety of aspartame consumption during pregnancy. The company has forwarded relevant extracts from scientific journals to the Central Committee of Food Standards (CCFS).

It is not known what are the labelling changes being recommended by CCFS. A Gujarat company has been advertising aspartame without incorporating the statutory warning, without inviting any punitive action. Multinationals have often been criticised for double standards in marketing their products in home territory and in the Third World.

This is a novel case of a multinational being forced to adopt a different standard only for Indian market.

WORLD'S FIRST FILARIA TEST KIT RELEASED

Prof. M.G.K. Menon, Scientific Advisor to the Prime Minister and also member of the Planning Commission, on September 26, released the world's first immuno-diagnostic kit "Filatest" for the detection of bancroftian-filariasis commonly known as elephantiasis.

The invention is the result of a close interaction between the scientists at Mahatma Gandhi Institute of Medical Sciences, Wardha and the Research and Development Division of Cadila Laboratories, Ahmedabad.

PACKAGING COSTS OF DRUG FORMULATIONS

50 percent hike to be granted

The Government has decided to grant a 50% hike in the packinging costs across the board while fixing prices of drug formulations. A notification to this effect is expected to be issued shortly it is learnt.

The price revision of drug formulations were on the basis of packaging norms fixed by the Government in 1974. No revision of packaging norms was considered even when the government revised the conversion norms early this year.

The Government decision is owing to an all-round and steep increase in the costs of several packaging materials such as glass bottles and ampoules, paper, aluminium foils, plastic, cartons, etc. during the last few years.

Industry sources point out that in the last year itself the prices of aluminium foils, glass bottles and paper cartons have gone up by 60 to 100%.

As packaging costs were based on the norms fixed by the government in 1974 several drug units making formulations have been facing severe pressure on their profits for some years now.

The government's decision to grant a 50% increase in the packaging costs is thus likely to push up the prices of many formulations.

Meanwhile the authorities are yet to fully implement their order of raising the conversion norms for the manufacture of drug formulations, issued in February 17, 1989.

One of the clauses of that order states that the drug units can get an extra 10 per cent conversion cost over and abo the revised norms if they had go manufacturing practices (GMP) m than the standards prescribed under Drugs and Cosmetics Act, 1940.

Neither the Food and Drug Admi istration of various states nor the re onal offices of the Drug Controller India have received any instructio regarding the new norms. The dr companies which have set up GM facilities have been asking for a re sion of conversion norms and ext incentives.

Applications of drug companies f revision of formulation prices based the new conversion costs are lying wi the government for quite some tim Industry sources said that the author ties were going slow over the revisio of formulations prices on the basis new conversion norms as it feared th it would lead to a general increase i drug prices.

Phosphoric acid imports through MMTC proposed

The Finance Ministry has proposed to canalise imports of phosphoric acid and ammonia through the Minerals and Metals Trading Corporation (MMTC).

At present, both phosphoric acid and ammonia are imported through the Department of Fertiliser. The Finance Ministry wants imports of fertilisers to be handled by one nodal agency. Since MMTC is already dealing in imports of urea, potash, sulphur, etc, it could well handle imports of phosphoric acid and ammonia as well.

The proposal has been sent to the Ministries of Commerce and Agricultkure which are the administrative ministries for MMTC and Department of Fertilisers, respectively, for evaluation.

Recently, phosphoric acid imports had hit the headlines following formation of cartel by Morocco, the principal supplier of phosphoric acid to India.

Handling of imports of phosphoric acid and ammonia by MMTC would have another added advantage. Since MMTC has been dealing in this line for the past three decades, it has developed the requisite expertise and contacts. It can also use its bulk purchasing strength for effecting imports.

Though, at present imports of phosphoric acid is not its subject, MMTC has proposed a novel idea to ensure steady imports of the vital commodity.

It has proposed to take on lease the rock deposits of overseas companies attached to DAP plants and in turn pay a royalty to them. This would help reduce dependence on phosphoric acid.

At present India imports about two million tonnes of phosphoric acid and one million tonne of ammonia, the two vital raw material for seven DAP plants in the country. Of the two million tonnes imports of phosphoric acid, one million tonne is imported from Morocco. Taking advantage of India's excessive dependence on it, Morocco recently formed a cartel of phosphoric acid supplies and raised the prices substantially.

The prices of phosphoric acid which were about $ 425 a tonne in the second half of 1988 were raised to $ 525 by the first half of 1989.

The Department of Fertilisers, after hectic negotiations with Morocco, brought down the prices to $ 480 which was not agreeable to the Finance Ministry.

This resulted in closing down of DAP units resulting in additional import of DAP. To counter this MMTC has proposed to take on lease the rock deposits. Earlier, the corporation had plans to go in for joint vetures for setting up DAP plants.

However, the lease system would help in considerable savings for the country. While a million-tonne capacity plant would today cost minimum Rs. 700 crores, the leasing would help MMTC save this money. It would also have no mining and processing cost.

The Planning Commission has also on the other hand suggested not to grant any fresh licence for DAP units. Hence, in the absence of phosphoric acid imports, considerable shortage of DAP is not ruled out.

However, if MMTC's idea of taking on lease rock deposits comes thorough, it is expected that the country would tide over DAP shortage problem.

RAMAGUNDAM FERTILISER PROJECT: EQUIPMENT IMPORT TERMS NOTIFIED

The Government has notified licensing conditions for the import of equipment and services under the Japanese credit of 11.132 billion yen for the Ramagundam fertiliser plant rehabilitation project of the Fertiliser Corporation of India.

According to a public notice issued by the chief controller of imports and exports on September 14, import licences under this credit, extended by the Overseas Economic Cooperation Fund of Japan, can be issued only for such items and for such value as have been specifically cleared by the directorate-general of technical development. Their CIF value should not exceed 12.245 billion yen.

No remittance of foreign exchange will be allowed against these import licences, Moreover, insurance charges will be payable in India in rupees, the notification has stated.

The licences will be issued only in favour of the Fertiliser Corporation of India.

IRAQI SULPHUR FOR INDIA

India has purchased one lakh tonnes of Iraqi sulphur from the traders Trammo and Helm for shipment during October to December.

Each sale of 50,000 tonnes has been agreed to $ 83.25 per tonne fob Umm cast, including 60 days payment and 40% counter-trade terms.

Though the price incorporates concession to compensate for the poor quality of Mishraq sulphur with high ash and acid content, yet the prices, according to informed sources, represent new low for West Asia tonnage to India.

The rate works out to $ 80 per tonne fob Umm cast. Inclusive of freight currently at $ 22-24 per tonne on the Umm East-India route, the delivered price will be around $ 101 to $ 103 per tonne C and F sight equivalent.

IPCL priority for Gandhar project

With the Union Government according approval for setting up an integrated petrochemical complex based on Gandhar gas in Gujarat, the State-owned Indian Pertrochemicals Corporation Ltd. (IPCL), has decided to shelve the proposed expansion projects at Baroda and concentrate its investment on the new gas cracker.

The Chairman and Managing Director of IPCL, Mr. Hasmukh Shah, told newsmen at New Delhi, on September 25, that the total investment by the Corporation during the Eighth Plan would be Rs. 3,200 crores. Of this, a major chunk of Rs. 2,290 crores would be accounted for by the Gandhar project. Work on this project has already commenced and the Prime Minister, Mr. Rajiv Gandhi, is to lay the stone for the complex soon.

The site selection committee with Mr. J.J. Mehta as its Chairman has recommended a location near Dahej in Bharuch district. In all likelihood, the exact location will be at a place called Jageshwar, south of Gandhar. This site, Mr. Shah said, is being chosen considering the proximity of gas availability from the Gandhar fields, salt availability for the caustic/chlorine plant and on environmental considerations with no habitation within three kilometres of the venue in the wind direction.

Based on Gandhar gas and supplemented by 2.35 lakh tonnes of condensate per annum, the product-mix of the complex will comprise three lakh tonnes per annum (TPA) of ethylene with infrastructural facilities to raise it to four lakh tonnes annually, 1.5 lakh tonnes of polyvinyl chloride (PVC), 1.2 lakh TPA of ethylene oxide (EO)/mono ethylene glycol (MEG), one lakh TPA of alpha olefins, one lakh TPA each of primary alcohols and alcohol ethoxylates, 1.2 lakh TPA of caustic soda and 1.05 lakh TPA of chlorine.

The product-mix, Mr. Shah said, is primary oriented to chemical products and surfactants considering the locational and environment-linked options. A unique feature is the introduction of a new class of surfactants based on alpha olefins, he said.

The complex is expected to be completed in four years from the zero date, that is when all the clearances have been granted. As of date, IPCL has obtained clearance for the first stage.

The complex will have its own integrated utilities system and also a captive power plant of 75 mw capacity. Adequate measures for waste water treatment, air quality systems and disaster management are being incorporated in the design stage itself, he said.

Besides, IPCL and the Gujarat Industrial Investment Corporation (GIIC) are planning to set up a joint venture for establishing a port terminal at Dahej to act as a nodal point for import and export of petrochemical products in solid, liquid and liquefied gas forms.

As for finances for the Gandhar project, Mr. Shah said IPCL would not depend on budgetary support. Funds will be obtained from the Exim Bank, internal resources and through public equity issues. The project may also be posed to the World Bank for assistance and commercial borrowings. Foreign exchange for the project would thus not be a problem, Mr. Shah said.

Mr. Shah refuted the view that the Gandhar project has been given to IPCL as a settlement for the Auraiya gas cracker which has been bagged by Gas Authority of India Ltd. (GAIL). He said a petrochemical complex at Gandhar had been recommended by the Abid Hussain Committee in view of the rich gas reserves.

There would be more scope for development at Gandhar and it was for this reason that the Baroda expansion projects were being stayed. Partly for environmental reasons, only the modernisation projects at Baroda would be implemented, he said. With Rs. 2,290 crores going towards Gandhar, the balance from the Rs. 3,200 crores is to be invested in seven other projects, three at the Maharashtra Gas Cracker Complex (MGCC) at Nagothane and the rest four at Baroda. These are expansion of the MGCC cracker from three lakh tonnes to four lakh tonnes of ethylene, expansion of the high density polyethylene (HDPE) plant to 75,000 TPA and the wire and cable compounds project.

The Baroda projects are a grassroot polypropylene (PP) plant to replace the existing one, modernisation of the butadiene plant to 34,000 TPA and of the polybutadiene rubber plant to 50,000 TPA. The seventh is to set up a project for the manufacture of engineering plastics in collaboration with a foreign company. Meanwhile, rains during the monsoon have delayed the commissioning of MGCC. Mechanical completion was to have been done by August this year. Trial runs would thus be in January next year instead of December this year, Mr. Shah said. IPCL planned to crack LPG as an interim measure till such time as ONGC's ethane and propane facility at Uran is commissioned, he added.

PUNJAB CHEMICALS AND PHARMACEUTICALS

The 100% export oriented unit of Punjab Chemicals and Pharmaceuticals is expected to go on stream by December 1990, according to Mr. G.C. Shroff, Chairman. Work on the project has already started.

The company has been exporting oxalic acid and diethyl oxalate in large quantities. It expects to achieve an export turnover of Rs. 5.25 crores in the current year. In the first five months of the current year the company had exported these chemicals worth Rs. 1.28 crores.

POLLUTION CONTROL MEASURES

Improved performance in chemical industry

Most industrial units have initiated measures to prevent pollution and treat pollutants, according to a survey by the Federation of Indian Chambers of Commerce and Industry (FICCI). The survey, based on responses of 400 units all over the country, says safety is also given consideration by most units. The survey, entitled "Pollution control in industry: Present status and prospects", found that 302 units have initiated pollution abatement measures and 272 have taken steps to treat pollutants.

Specific measures, such as, appointment of consultants, installation of monitoring instruments, organisation of training programmes for employees, recycling of wastes and recycling and conserving water, are extensively carried out. Not many units have foreign collaboration in the area, the survey says.

The survey says larger units have been able to initiate more measures to control pollution. Chemicals and cement industry groups have performed better in prevention of pollution. Chemicals, sugar and distillery, leather, paper and tyre and tube industry have performed better in treatment. 'Safety' has been attended to by units in all the groups. Scientific monitoring has been established in greater measure in the chemical and cement industry than in others. A similar status obtains in training programmes and reuse and conservation of water.

The problem of delay in obtaining clearances such as no objection certificates, or consent, is significant. More than 60 per cent of the units experienced a delay of between five months and three years. The pollution control boards should grant consent for three to five years at a stretch. Periodical inspection can be carried out, the survey says.

The grant of no objection certificates for manufacturing of new articles, as part of the diversification process of the units should not be linked to the completion of treatment work in the existing units. The survey says, that it would be desirable to have a single window for all clearances required from the pollution angle. Testing and sampling procedures need to be rationalised.

The respondents felt that other measures to provide an impetus to the environment protection and pollution control programme were: Availability of finance on softer terms, awareness creating programmes, training programmes, easier access to equipment and better service from suppliers, establishment of common effluent plants, sponsoring research and development studies in the area, and a lower rate of tariffs for water and electricity supply.

IMPORT OF CRUDE, PETRO-PRODUCTS: Rs. 120 CRS. MORE FOREX RELEASE SANCTIONED

The Union Finance Ministry has agreed to release additional foreign exchange of Rs. 120 crores for import of crude oil and petroleum products in the current financial year. This follows representation by the petroleum ministry that keeping consumption of petroleum products to the levels suggests by the finance ministry would mean introducing severe curbs on consumption of motor spirit and diesel oil.

Though the release of additional foreign exchange by the finance ministry does not fully meet the demand of the petroleum ministry which wanted foreign exchange of about Rs. 200 crores extra another review of the demand-supply position of petroleum products would be carried out in December to determine further imports.

The release of extra foreign exchange would enable the petroleum ministry to import about 4.5 lakh tonnes of additional high-speed diesel. Motor spirit availability would improve to the extent naphtha is not exported though there will be less foreign exchange saving.

Paradeep refinery project may have private sector partner

The Government has decided to explore the possibility of implementing the Paradeep refinery project in joint venture with suitable private parties, says an official press release.

The release says that based on the offers received by the Petroleum and Natural Gas Ministry and the Indian Oil Corporation, and depending on the suitability of the response from the parties from the financial and technical angles, it is expected that the government will be in a position to take a final view regarding joint venture in the near future.

The Paradeep refinery project is estimated to cost about Rs. 1,600 crores, including the cost of laying the crude oil pipeline from the Paradeep port to Daitari, the site of the refinery.

Crude oil for the refinery will be arranged by the Government or the Indian Oil Corporation, which will be the public sector partner in the joint venture. The Corporation has already prepared the feasibility report and has also taken some advance action in site selection, etc.

The release says that it is possible to make suitable arrangement through joint venture to meet the foreign exchange and rupee cost of the project without recourse to significant dependence on the domestic financial institutions. It should be possible to complete the project during the Eighth Plan.

The proposal is to set up a six million tonnes per annum refinery to meet the petroleum products requirement in the eastern region.

The demand for kerosene and diesel is very high and requirement for furnace oil is low. Hence the process units have been selected with a view to meet this product requirement, the release said.

The process units to be included consist of a crude distillation unit, vacuum distillation unit, once-through hydrocracker, fluiding catalytic cracker hydrogen generation unit, bitumen unit sulphur recovery unit alongwith treating units for naphtha, LPG, etc. Adequate tankage for crude oil and for products will be also provided. Preliminary discussions have been held by the Indian Oil Corporation with various process licensors for selection of appropriate technology for incorporation in the refinery. To ensure minimum environmental pollution, special precautions will be taken.

Sulphur recovery unit to minimise the sulphur dioxide emission has been included. After the petroleum products are refined by the joint venture company, they will be sold to the Indian Oil Corporation. The corporation will make its own investment in the rail loading multi-products gantories and storage tank, etc.

The State Government will assist in acquiring about 1,500 acres of land for the refinery. The crude oil will be received at the Paradeep port and stored at the oil terminal 10 kms away from Paradeep port. It will then be transported through a 100 kms pipeline to Daitari. A captive power plant with a capacity of 50 has also been planned at the refinery to meet the power and steam requirements. Water requirements of the refinery will be met from the Brahmuli river two kms south of Daitari.

Personalities

Mr. K.R.V. Subrahmanian, Managing Director of Colour Chem Ltd., has been elected Chairman of Roha Industries Association.

Mr. B.V. Gandhi of Excel Industries Ltd. and **Mr. C.N. Prabhu** of Bombay Dyeing have been elected hon. secretary and hon. treasurer respectively.

BPCL refinery in joint sector

The Union Government has decided to consider the implementation of Bharat Petroleum Corporation Ltd.'s Central India Refinery Project through a joint venture with suitable private parties.

Depending upon the response from the private parties and the suitability of offers, both from financial and technical angles, it is expected that Government will be in a position to take a final view regarding the joint venture in the near future. The Central India Refinery project is estimated to cost Rs. 1,900 crores, excluding the cost of single point mooring terminal with support facilities at Vadavan Point in Maharashtra (about 100 kms north of Bombay) and laying of crude oil pipeline from Vadavan Point to a location in Central India.

Bharat Petroleum Corporation Ltd., which will be the public sector partner in the joint venture, has already prepared a feasibility report and has also taken some advance actions in identifying the coastal location for putting up the crude oil terminal for receipt of crude oil and possibel suitable sites for refinery in Central India.

The proposal is to set up a six million tonnes per anum refinery to produce normal range of petroleum products to meet the requirements in Central India and lube oil base stocks to make up overall deficit in the country. The selection of process units is based on the imperative need to maximise production of middle distillates. Bharat Petroleum Corporation Ltd. has had preliminary discussions with various process licensors for selection of appropriate technology for incorporation in the refinery.

McDOWELL GOING IN FOR LARGE-SCALE EXPANSION OF VIZAG UNIT

McDowell and Company, of UB group is going in for large-scale ex sion at its existing unit at Vishaka nam.

The proposed expansion, is b effected for the manufacture of 5, tonnes per annum of acrylonitrile adiene styrene (ABS) involving investment of Rs. 28.44 crores, a modification in the means of finar originally submitted to the governm

The earlie: pattern of financing project was in the order of Rs. 28 crores comprising internal generat (Rs. 5.91 crores), fresh equity cap (rights basis) (Rs. 7.88 crores) debentures (Rs. 14.64 crores).

In the modified proposal the inter generation has been brought down to level of Rs. 5.39 crores and the fr equity capital and debentures enhanc to Rs. 11.52 crores each. The compa argued before the government that main reason for the change in the p tern of finance was to adjust the va ations in equity/debentures compone on the basis of its profits and reserv

IOC turnover put at Rs. 15,343 crores

The turnover of Indian Oil Corpora- has reached Rs. 15,343 crores ing 1988-89, representing a growth 7.3 per cent over the previous year. the fifth successive year, the Cor- rations six refineries achieved over 0 per cent capacity utilisation.

Indian Oil earned Rs. 676 crores ofit during the current year, compared th Rs. 572 crores in the previous year, presenting an increase of 18 per cent. e improved financial results had couraged the Board of Directors to clare a dividend of 20 per cent, nounting to Rs. 25 crores. In 1987-88, vidend declared was 18 per cent.

Mr. S.L. Khosla, Chairman, in a ess release issued at Bombay claimed at the Corporation's six refineries corded a crude oil throughput of 22 illion tonnes besides achieving 100 r cent capacity utilisation for the fifth ccessive year.

Mr. Khosla added that the sales per mployee during 1988-89 had gone up 2008 tonnes compared to 1,908 nnes in the previous year. Refinery roughput per employee had gone up 2,556 tonnes as compared to 2,539 nnes in the previous year, according him,

Mr. Khosla said that the value added during the year went up by over six per cent to Rs. 1,095 crores. The Corporation also contributed Rs. 2,931.33 crores to the Central Exchequer in the form of duties and income tax, compared to Rs. 297.29 crores in 1987-88.

Mr. Khosla said that the Corporation's capital expenditure of Rs. 278.50 crores incurred on various projects during the year was financed from internal resources. Nearly 81 per cent of Indian Oil's fixed investments of Rs. 2,793 crores in various units were also financed from internal resources, he added.

Indian Oil achieved product sales of 28.99 million tonnes during the current year, registering a growth of seven per cent over the previous year, according to Mr. Khosla. The industry sales during the current year were 50.01 million tonnes.

Mr. Khosla said that projects valued at over Rs. 1,500 crores were already in various stages of implementation. The Rs. 635-crore additional secondary processing facilities at Gujarat refinery to convert heavy ends into distillates are expected to be completed by early 1992, according to him. Additional tankage schemes had been taken up at various units to increase the storage capacities, he said.

Karnal refinery DPR being recast

The fate of six-million tonnes Karnal refinery in Haryana continues to hang in balance with the Centre now deciding to recast its original detailed project report (DPR).

Mr. Khosla said the scope of the project has been changed keeping in view the changed demand scenario of petroluem products in the country.

The foundation stone of this jinxed refinery was laid by the Prime Minister, Mr. Rajiv Gandhi, with much fanfare in 1987, on the eve of elections to Haryana Assembly. However, after the rout of Congress (I) in elections, the Centre lost interest in the project.

Mr. Khosla said that the Soviet offers received for technical assistance and turnkey operations have also been reviewed. At India's instance, the USSR has resubmitted its offer. "It is under scrutiny now", he added. Meanwhile the cost of the project has moved upto Rs. 1,800 crores, from the original estimate of Rs. 1,200 crores.

Because of the stalemate in the case of Karnal refinery, the fate of Viramgam-Chaksu-Karnal pipeline also continues to be uncertain. The progress of this pipeline is linked with the progress of the Karnal refinery, Mr. Khosla said.

New sources being sought for crude import

IOC is trying to diversify its sources for import of crude oil which are at present concentrated in the Gulf. In this connection the possibility of import of crude oil from Australia is being examined. This crude will have to be tested to find its suitability for Indian refineries. A contract has recently been entered into with Malaysia for import of crude after it had been tested in Indian refineries for about a year.

Mr. Khosla, said however that Chinese crude has not been found suitable and China has no petroleum products to spare. Mr. Khosla said that in spite of the fluctuating prices in the international market last year, IOC, the canalising agency for crude oil, was able to derive maximum advantage by adopting a judicious blend of term contracts and spot purchases.

To meet the deficit in the availability of indigenous crude during 1988-89, IOC imported 17.3 million tonnes of crude oil valued at Rs. 2,651 crores, and six million tonnes of fuel products valued at Rs. 1,398 crores. Two million tonnes of products were exported. The corporation also earned foreign exchange worth Rs. 138.97 crores, primarily through supplies of aviation fuel to international airlines and through bunker supplies to foreign flag vessels.

The R & D Centre of Indian Oil, at Faridabad, said to be the only one of its kind in the petroleum industry, spent Rs. 11.89 crores on various R & D programmes during 1988-89.

Mr. Khosla said that the Corporation continued to place emphasis on fuel conservation and reduction in hydrocarbon losses at all its plants and units, including the refineries. The various schemes implemented during 1988-89 at the Gujarat, Haldia and Mathura refineries alone are estimated to contribute fuel savings of 43,750 tonnes per year.

The major projects completed by the Corporation during 1988-89 include revamp of crude distillation units (CDU) and heat exchanger train optimisation at Gujarat refinery at a cost of Rs. 17.80 crores which would result in increase in processing capacity by 1.4 million tonnes per year besides fuel saving of 17,600 tonnes per year. The revamping of crude distillation unit at the Mathura refinery at a cost of Rs. 5.62 crores would increase the processing capacity of the refinery by 1.5 million tonnes per year.

The commissioning of two pipeline stations during the 1988-89, at Sidhpur and Kot at a total cost of Rs. 12.66 crores would enable pumping of Bombay High crude in unlimited parcel size during winter. A modern telecommunication system was also installed for the Mathura-Jalandhar pipeline at a cost of Rs. 7.5 crores. An effluent system was also commissioned at the Digboi refinery at a cost of Rs. 6.35 crores, Mr. Khosla said.

Other projects which are under various stages of implementation, include facilities for increasing production of slack wax at Barauni refinery (estimated cost Rs. 12.70 crores), heat exchanger train optimisation and unit revamp of crude distillation unit at Barauni refinery (estimated cost Rs. 11 crores), and revamp of solvent dewaxing unit at Haldia refinery for increasing production of lube base stocks (estimated cost Rs. 5.85 crores). Modernisation of the Digboi refinery, the oldest working refinery in the world, at a cost of Rs. 143.74 crores was approved in June 1989.

New refinery in Orissa

Mr. Khosla said that a number of new projects had been planned and were awaiting the Government approval. Some of the major new projects included setting up of the catalytic reforming unit at Barauni and Digboi refineries to improve the quality of petrol, a unit to separate propylene at Mathura, revamp of lube block at Haldia, Kandla-Bhatinda and Haldi Budge Budge product pipelines.

Mr. Khosla said that the Indian C had submitted a feasibility report to t Government on the proposed six millio tonnes refinery at Daitari in Orissa. Th refinery is estimated to cost Rs. 13,46 crores, with a foreing exchange com ponent of Rs. 222 crores. The feasibi ity study had also proposed a 928-k Paradeep-Daitari-Allahabad pipeline a an estimated cost Rs. 561 crores, wit a foreign exchange component o Rs. 96 crores, he added. The refinery a Daitari which is expected to be com missioned within 48 months of th approval, would have a hydrocracke with a capacity of 1.6 million tonnes an a fluid catalytic cracker (FCC) with a 0.65 million tonne capacity.

The 928-km pipeline would have two sections — one a crude pipeline of 100 kms from Paradeep to Daitari at a cost of Rs. 145 crores and the other a product pipeline of 828 kms from Daitari to Allahabad with tap-off points at Rourkela and Ranchi and despatch facilities at Rourkela, Ranchi and Allahabad. The capacity of this product pipeline would be three million tonnes a year. It is estimated to cost Rs. 416 crores, with a foreign exchange component of Rs. 63 crores, Mr. Khosla said.

ZUARI AGRO CHEMICALS

Zuari Agro Chemicals Ltd., a unit of the Birla group, is putting up a plant for the manufacture of hydrogen peroxide at an estimated investment of Rs. 45 crores. The company is seeking clearance to its proposal from the monopoly angle. The annual licensed capacity proposed is 5,500 tonnes. Under the scheme of finance proposed, the company hopes to generate Rs. 15 crores from internal sources for funding the project. The balance Rs. 30 crores will be met either through term loans from financial institutions or through a debenture issue. The plant is to be located at Zuari Nagar, Goa.

ligh crude prices may hit trade balance

India will have to reckon with rising ternational prices and high interest es this year also. A World Bank sessment expects the international ices of minerals and metals which had sen steeply in 1988 to remain firm. he rise in petroleum crude prices how-ver, might adversely affect the overall rms of trade.

While Indian exports might continue fetch prices, India might not benefit s much as some of the newly industri-lised economies (NIEs) like South orea from higher international prices or machinery. The investment and con-umption boom last year in industrial-ed countries had steeply pushed up orld trade in manufacture by 10 per ent. The NIEs who had re-oriented eir export composition towards manu-acture are South Korea, Taiwan, ndonesia and Thailand.

With the petroleum oil prices going own by as much as 20% in 1988, oil xporting countries experienced a fall of 7% in their terms of trade while non-il primary goods exporters registered gain of 7 per cent. The World Bank ssessment says that if the recent pward trend in oil prices continued fol-owing agreements to cut production by oth OPEC and non-OPEC, 1989 might ee a reversal in the trend of terms of rade.

The boom in the exports of minerals nd metals in 1988 was due to accel-ration in the investment of the OECD rea. As a result the exporters of min-rals and metals had received 40% more n dollar prices. The World Bank ssessment says that "should supplies ontinue to be tight and strong growth ontinue in the industrialised countries hen prices can be expected to remain irm, at least in the short run."

If the oil prices continue to rise as hey have done at the beginning of 1989, here may be a slide back in the terms of trade of developing countries particularly for India, it being a major oil importer.

SELF-SUFFICIENCY: A FAR CRY

India's level of self-sufficiency in oil is expected to fall marginally from 66% at present to about 65% by the end of the Eighth Plan period.

According to official projections, production of crude oil is envisaged to be about 51 million tonnes in the terminal year of the Eighth Plan against the projected demand of 78 million tonnes.

The report of the Planning Commission's sub-group on exploration and development said that the level of self-sufficiency would fall further if, by the turn of the century, the growth in demand of petroleum products was not checked by effective inter-fuel substitution, energy conservation and efficiency in the use of energy.

India's energy balance today includes a 60% share from commercial sources and 40% from non-commercial sources.

OPEC PANEL FAVOURS PRICE STABILITY TILL 2000

OPEC's long-term strategy committee favours keeping OPEC's target oil price unchanged in real terms over the next 10 years. This option would be easiest to manage according to the report. The target price is now $ 18 per barrel.

The report forecasts that demand for oil will increase by 1.4 per cent per year between 1990 and 1995 and 0.6 percent per year in the following five years. This assumes inflation averages slightly more than 4 per cent per year to 2000 and economic growth averages 2.5 per cent annually in the industrialised countries.

In inflation-adjusted terms, oil would have to cost $ 23.4 per barrel in 1995 and $ 29.4 in 2000 to keep its real value, the report said.

OPEC production could therefore be sustained at 26.5 million barrels per day by 1995 and 30.2 million by 2000, it says.

The report also offers two other scenarios based on maintaining a nominal $ 18 oil price and on a higher price, but suggests that both of these would be difficult for the organisation to sustain.

A low price target would cause problems because it would mean lower returns for high production, it says. But a high oil price would produce better returns, but could prompt continued pressure from countries with large oil reserves for bigger OPEC output quotas.

The report also recommends that OPEC's strategy remains flexible and capable of adjusting to market trends, so that the $ 18 target price should not be considered sacrosanct.

The report is a first draft prepared by OPEC's long-term strategy experts. It will be revised by OPEC ministers over the next year, and, if agreement on it is reached, it will be presented to the OPEC summit meeting next September.

HICO PRODUCTS

Hico Products Ltd. is designing a suitable product mix to ensure better capactity utilization within the available raw material position.

Addressing the company's shareholders, Mr. M.D. Dhamankar, Chairman and Managing Director, said that the company is also venturing into backward integration in the areas like alkyl phenols and other chemicals which already enjoy Government protection through its import policy.

The order book position of the company is encouraging with sales for the current year ended August 1989 put at Rs. 19.35 crores.

OIL EXPLORATION IN SOUTH:

Rs. 3000 cr. outlay planned

The Oil and Natural Gas Commission hopes to make a beginning in the setting up of a 'gas grid' in the southern region during the Eighth Plan. An outlay of Rs. 3,000 crores has been proposed for oil exploration in the southern region during the plan of which Rs. 1,600 crores is proposed for the Cauvery basin and the rest for Krishna-Godavari basin and for Andamans.

Disclosing this in Tiruchirapalli, on September 23, Mr. N. Krishnamurthy, Regional Director, ONGC, Southern Region, said that ever since the inception of the oil exploration programme, a sum of Rs. 900 to Rs. 1,000 crores had been spent in the southern region, of which a sum of Rs. 400 crores had been spent for the Cauvery basin and the rest for Krishna-Godavari basin and Andamans.

Mr. Krishnamurthy pointed out that in Cauvery basin, the present production of associated gas was of the order of one lakh cubic metres per day. Of these, they had already committed to supply 28,000 cubic metres per day. A 14 km pipeline had been laid from Narimanam to Nagappattinam by ONGC. The Tamil Nadu Electricity Board had decided to set up two 5 mw gas-based power plants.

In the Cauvery basin, the gas production potential would grow from the present one lakh cubic metres per day to around four lakh cubic metres per day by 1992-93. It would go up to two million cubic metres per day by 1993-94 and by the terminal year of the Eighth Plan, it is expected to reach a level of 2.75 million cubic metres per day.

Mr. Krishnamurthy said that ONGC was taking steps now to popularise the use of natural gas as an effective alternative to oil. This had become essential as the region was poised for an accelerated growth in gas production during the Eighth Plan. He said that depending upon the response, ONGC would consider the laying of a separate pipeline from Narimanam to Tiruchirapalli to transport associated gas.

NO TO RIL PLAN FOR GAS-BASED POWER PLANT

The proposal of Reliance to set up a power plant based on gas from the Gandhar field in Gujarat has been turned down. Gas from the field is estimated to be enough to run two power stations of 600 mw each. The Government has now decided that one of these stations will be run by the Gujarat State Electricity Board and the second by the National Thermal Power Corporation. Hence there is no gas left for power generation by Reliance or any other private party.

According to the Gujarat Government, power generated from Gandhar gas will be much cheaper than that from offshore gas. This is because offshore gas supplied by the HBJ pipeline includes the cost of transportation over a long distance as well as desulphurisation.

Gandhar gas will be converted into power near the oilfield and so the gas should cost much less. This makes the gas an attractive proposition for private parties, but now it will be kept for the public sector. Ethane and propane will be extracted first from the gas and used in a new petrochemical cracker being set up by Indian Petrochemicals Ltd. The remaining lean gas will then be used for power generation. The project should come up early in the Eighth Plan.

RS. 105-CR. ICICI AID PACKAGE FOR RELIANCE INDUSTRIES

The Industrial Credit and Investment Corporation of India (ICICI) has decided to fund Rs. 105 crores to Reliance Industries Ltd. for the expansion of its Purified Terephthalic Acid (PTA) plant at Patalganga in Raigad, Maharashtra. Recently, it approved this aid package — which was to be shared among the three all-India financial institutions, ICICI, IDBI, (Industrial Development Bank of India), and IFCI (Industrial Finance Corporation of India).

The loan totalling Rs. 69 crores will be given at a concessional rate of 14%, while Rs. 36 crores will be advanced toward the foreign exchange cost of PTA plant. Under the ERAS (Exchange Risk Administration Scheme), the rate is expected to vary between 15 and 18%.

The clearance was obtained just before the ICICI Chairman, Mr. N. Vaghul, left for the US recently. As revealed in a section of the press, the loan is ostensibly for the purpose of installing "critical standby equipment", but is actually an expansion of capacity over and above that which has been licensed.

This is distinct from the Rs. 225 crores package which is being processed by the financial institutions secretly for joint inter-institutional assistance on concessional terms. The two projects together should increase Reliance's PTA capacity to well over the 192,000 tonnes which was being produced before the flood damage of last August.

ONGC TO UPGRADE PALAR BASIN

The Oil and Natural Gas Commission (ONGC) has planned to upgrade the Palar basin, which lies between the Krishna-Godavari (Andhra Pradesh) and Cauvery (Tamil Nadu) basins and intensify exploration work. ONGC sources said that Palar basin (also known as Gondwana basin) is a category four basin. It extends between Nellore to Kanchipuram onland and into Bay of Bengal offshore.

PUBLIC SECTOR OIL EXPLORATION PROJECTS:

Simplified norms likely

The Government is examining the question of simplifying procedures for clearing investment proposals for public sector projects in the fields of oil exploration and production. The simplification would mean exemption for such projects from the requirement of obtaining the first stage clearance by the Public Investment Board (PIB).

At present, PIB follows a two-stage clearance policy. The board is an inter-ministerial body, which periodically considers investment proposals for all major public sector projects and approves them after a thorough scrunity.

All public sector projects, with the exception of those belonging to the coal and power sectors, are obliged to follow the two-stage clearance procedure. In the first stage, PIB approves the project in principle and directs the public sector units concerned to prepare a detailed feasibility report.

The second stage considers the feasibility report and either approves or rejects it. Subsequent to its approval, the project is referred to the Cabinet for its approval depending on the value and size of the project.

If the government does agree to extend the exemption from the first stage clearance to the oil exploration and production sector, observes feel that the time taken in clearance of projects in such a key area would reduce considerably and projects would be implemented without much delay and cost over-run.

Normally, the first-stage clearance takes about two months. Subsequently, the feasibility report has to be prepared for the second-stage clearance.

The whole exercise thus takes not less than a year. If the requirement of the first-stage clearance is dropped, at least a couple of months' time will be saved. What has prompted a review of this matter is the recent reluctance of Oil and Natural Gas Commission (ONGC) and the Petroleum and Natural Gas Ministry to send investment proposals for oil exploration projects for the first-stage clearance by PIB. Instead, they have been referring their proposals directly for the second-stage clearance.

It is learnt that PIB took strong exception to this tendency of ONGC to by pass the first-stage clearance. In the last few weeks, the PIB secretariat is understood to have sent back two of ONGC's proposals which the Petroleum and Natural Gas Ministry referred to be taken up directly for second-stage clearance. These two projects pertain to the development of the Mukta oilfields and Neelam oilfields in the western offshore area.

There are four more projects in the oil exploration and production sector, which the Petroleum and Natural Gas Ministry had planned to recommend for the second-stage clearance by PIB without going through the first stage. Following the PIB's objection, the ministry is understood to have referred back these proposals to ONGC.

In the meanwhile, PIB has initiated a review of its norms for examination of the investment proposals, in particular the need for exempting the petroleum sector from the first-stage clearance as it has done for the coal and power sector. The argument forwarded while exempting the coal and power sector from the first-stage clearance was that most of these projects are similar in nature and even though the capacities may be different, the components in the projects are qualitatively the same. The difference is only in terms of quantity.

But in the case of oil exploration and production projects, each proposal is different than the other because of the field in which the exploration or production work is undertaken. Thus the exemption facility was not extended to this sector.

The present review is to see to what extent the exemption can be extended without sacrificing the principle on the basis of which the first-stage clearance was stipulated. The PIB secretariat is at present scrutinising the technical details of oil exploration and production projects. Sources say a decision on this issue would be taken purely on such technical considerations.

OIL TO EXPLORE IN KUTCH-SAURASHTRA

Oil India Ltd. (OIL) will soon get oil exploration licence over 29,400 sq. km. in Kutch-Saurashtra offshore area and for 85,000 km. in Ganga valley onshore area, according to an Oil India press release.

The company has also obtained oil exploration licences in Orissa and Rajasthan, for onshore and Bay of Bengal and Andaman islands for offshore fields.

The OIL has recently signed an agreement on production sharing with two multi-nationals, Chevron and Texaco along with India for offshore exploration in Mahanadi and Krishna-Godavari basins. The agreement provides for OIL's option to invest up to 40% in the event of hydrocarbon discovery in the Bay of Bengal.

The release said the latest proved oil reserves in the Assam and Arunachal Pradesh have been put at 642.60 million tonnes of oil and equivalent of gas and in Rajasthan the geological gas reserves are proved to be over one billion cubic metres of gas. OIL has made a net profit of Rs. 86.56 crores in 1988-89. The company was awarded the second Indira Gandhi memorial national award for "excellent organisation."

THURA REFINERY POLLUTION:

ontrol measures show positive results

he Mathura refinery has taken var- 'environmental control' steps to ect historical monuments like Taj al and Sikandra. The Refinery's cutive Director, Mr. P.S. Teckchan-, said the impact of the refinery's ssion on the enviroment is being nitored.

A team of newsmen which visited the nery recently was shown the elab- e pollution control measures taken at a cost of Rs. 10 crore.

The environmental research labora- and various environmental groups expressed fear that the content of phur usually emitted from a refinery uld have a "damaging effect" on the ne work of Taj Mahal.

Besides this, it was also feared that air-pollution caused by the refinery uld have adverse effects on the Bha- ur bird sanctuary, which is also not from the refinery.

To allay the fears of environmental- the refinery has installed four air- nitoring stations at Farah, Keetham Sikandra in the direction of Agra at the Bharatpur bird sanctuary. The tions had started functioning well ore the commissioning of refinery in 32.

The data collected by the stations had nfirmed that the sulphur dioxide level und the refinery was below the limit by the Central Pollution Control ard, Mr. Teckchandani said.

Even the observations of independent ncies like the National Environ- ntal Engineering Research Institute, gpur and the Uttar Pradesh Pollution ntrol Board had endorsed this, he imed.

Besides this, the refinery has installed o sulphur recovery units, continuous stack emission analyser and an absorption unit for recovery of hydrogen sulphide.

Mr. Teckchandani said various pollution control steps by the refinery which also included 'datalogging system' and introduction of the ambient air-monitoring van had shown that air-pollution at Agra itself, was posing threat to the life of the Taj Mahal.

Consequently, Agra's iron foundries and other industries in the vicinity of the Taj Mahal have to be removed he said. Mr. Teckchandani said the refinery has been celebrating 'World Environment Day' every year to create mass awareness of the need for environmental conservation.

The refinery which is processing crude oil over 100% of its capacity of six million metric tonnes per year has been catering to the needs of entire north-west of the country including Punjab, Haryana, Himachal Pradesh, Delhi, Jammu and Kashmir and parts of Rajasthan and Uttar Pradesh.

Refinery to be modernised

The refinery, the largest crude oil processing unit of the Indian Oil Corporation (IOC), has also embarked on a Rs. 15 crore modernisation plan to increase its refining capactity. The revamping plan, undertaken by the refinery last year, will raise the production capacity from 6 million tonnes per annum (MMTPA) to 7.5 MMTPA by December 1989, Mr. P.S. Teckchandani said.

"We have been able to modernise the plant by switching over to digital distributed control system and by setting up a preheater system for energy conservation," he said adding that the work was in full swing.

More World Bank funds for environment protection

Reflecting the concern in the industrial as well as the developing world over the degradation of the global environment, the World Bank has decided to step up its lending substantially for environmental protection measures. The Bank's two fold approach involves including environmental protection as an integral component of the development projects it finances and the funding of purely environment protection projects. For the fiscal year 1989, of the 225 projects approved by the Bank's Board, 85 had significant environmental components. It proposes to take up systematic environmental assessments of projects and includes environmental components routinely in its financing pattern.

30 Projects in the pipeline:

In 1989, the Bank had financed two projects with primarily environmental objectives. However, 30 major pure environmental projects are in the pipeline for the next three-year period and the total lending for these is expected to reach $ 2 billions.

Over the last three years, the Bank was being pushed towards paying more attention to environmental protection by environmental groups in the West. Its association with ecologically damaging projects such as the Narmada valley scheme, cattle ranching in Botswana, projects leading to destruction of the rain forests in Brazil and transmigration of people in Indonesia had drawn sharp criticism from environmentalists.

If in response to such attacks the Bank had taken some hesitant steps towards environmental protection, the call given by the Paris economic summit of the industrial nations for global environmental protection and the growing concern in the developing world over degradation have now prompted it to address environmental issues in a big way. Its commitment has been sought to be firmed up with a report on its support for environment that was reviewed by the Development Committee on September 25.

The Bank proposes to strengthen its technical ability to assess the environmental impact of projects and assist the borrowing countries in taking up such assessments. Among the areas of special concern are deforestation, the loss of bio-diversity, watershed degradation, desertification, pesticide management, industrial disasters and urban pollution that are normally associated with development projects. It would also react flexibly to new issues such as the deterioration of the ozone layer, the greenhouse effect, tropical deforestation, transboundary movement of hazardous wastes and acid rain.

Debt-for-nature swap

An interesting idea put forward by the World Bank President, Mr. Barber Conable, is the debt-for-nature swap under which the funds used for environmental protection by a borrowing country could be deducted from its outstanding debt. According to the World Bank, there are many situations in which debt-for-nature swaps could be undertaken though environmental protection could not be forced on a borrowing country by making it a condition for debt relief. For example, in the area of biodiversity, endangered species are concentrated in some countries and programmes for their protection can be worked out as part of the debt relief package.

Discussing the report, the Chairman of the Development Committee, Mr. B.T.G. Chidzero of Zimbabwe, said at a press conference that integration of environmental objectives into development projects would entail additional costs and called for additional concessional assistance to meet the higher costs.

He said that there were fears in developing world that the concern o environment may ultimately result shutting out modern technology a cautioned that environmental objecti should not be made part of any ri conditionality.

Asked if the Development Comm tee would support the creation of a se arate planet protection fund as suggest by the Prime Minister, Mr. Raj Gandhi, at the Belgrade nonalign summit recently, Mr. Chidzero hedg his answer. A separate fund for env ronmental protection may detract fro a total and integrated approach to deve opment of which environmental prote tion should be an important part. On t other hand, a separate fund could pr vide the additionality of resourc needed. He said that there had been litt discussion outside the nonaligned foru on the environment fund.

Fragmenting resources:

In contrast to his cautious replies i the press conference, Mr. Chidzero written statement seems more forthrigh in the rejection of any separate fund fo environmental protection. "We need t guard against the danger of fragmen ing resources for development in wha may be well meaning efforts for sep arate funding to deal with the environ mental problems, he said, in his remark to the Development Committee.

SM DYECHEM PLANS 100 PC EOU IN MAHARASHTRA

SM Dyechem Ltd. proposes to set up a 100% export-oriented unit for th manufacture of methanol in Maharash tra. The company already holds SIA registration for the manufacture of three lakh tonnes of methanol per annum, and has signed a memorandum of under standing with a foreign company t export half of its production on a buy back guarantee, according to Mr. S.M Shetty, chairman. Negotiations are also underway to export the balance portion he said.

Magnesium unit in Orissa likely

Moves are afoot to promote a 3,000 to 4,000-tonne-capacity magnesium metal producing unit in Orissa at a cost of Rs. 30-35 crores to cater to the export market and the limited domestic demand now being met fully from imports.

The world over, magnesium and magnesium alloys find extensive engineering applications in automotive, aerospace, and defence industries. The metal is used in India primarily as an alloying addition by the aluminium industry for its commercial grade (cg) part of production, besides in the minting of coins and in the automotive industries. In its pure form, magnesium is also used as a reducing agent, in the manufacture of titanium and zirconium metals.

With the closure of the 50,000-tonne-capacity plant of Norsk Hydro (Norway) because of pollution problems, a global shortage of the metal is stated to have emerged, while consumption in India is steadily going up with the rise in installed capacity of aluminium. With an estimated capacity of five lakh tonnes of aluminium by 1990, of which 2.5 lakhs would be of commercial grade, the domestic demand for magnesium metal for alloying in the Indian aluminium industry would be about 2,500 tonnes, it is stated.

The Industrial Promotion and Investment Corporation of Orissa Ltd. (IPICOL), which holds SIA registration for a magnesium metal unit, is exploring the possibilities of establishing a plant using the non-polluting pidgeon process based on calcined dolomite and ferrosilicon, both of which are available in plenty in Orissa. Unlike the other route based on sea water (brine) which is polluting and power-intensive and also requires huge capacities to become economical, the dolomite route can support plants of 3,000-4,000 tonnes size, which can take care of domestic demand and part of the export market. Such a unit would require only about three megawatt of power.

The Mukand Iron group, which is already setting up an aluminium rolled products unit in the joint sector with National Aluminium Co. Ltd. (NALCO) and IPICOL, is understood to have shown interest in the magnesium metal project. An EOU for magnesium metal would have the advantage of getting raw material on deemed export basis from the ferro-silicon industry in the state.

The present demand for magnesium metal based on import is about 1,200 tonnes and is expected to rise to 8,000 tonnes by 1995. Ube of Japan and Pechiney of France are stated to possess the latest technologies in the dolomite route to magnesium developed first in Canada. The Andhra Pradesh Industrial Development Corporation had promoted a project, Southern Chemicals, with a small capacity of 600 tonnes to try the indigenous technologies developed by the Central Electro-Chemicals Research Institute (CECRI), Karaikudi (Tamil Nadu) and the National Metallurgical Laboratory, Jamshedpur, respectively for the sea water and dolomite routes but as such no production capacity had materialised, sources said.

The proposed EOU would be able to buy imported technology in terms of the technology policy of the central government, it is stated.

GRASIM HBI UNIT ON STREAM BY 1992

The Rs. 400-crore gas-based sponge iron project of Grasim Industries at Raigad district, Maharashtra with a licensed capacity of six lakh tonnes per annum of hot briquetted iron (HBI) is expected to be on stream in the second quarter of 1992, according to Mr. Aditya Vikram Birla, chairman. The company has tied up with Hylsa, Mexico for the project.

To part finance the sponge iron project and also to enable its shareholder to participate in the company's increasingly "bright future", Grasim is raising Rs. 125 crores through an issue of 12.5 per cent partly convertible debentures of Rs. 120 each on rights basis. Each debenture comprises two parts — a convertible part of Rs. 60 and a non-convertible part of Rs. 60.

The convertible part of Rs. 60 will automatically be converted into one equity share (Rs. 10 face value and Rs. 50 premium) on June 1, 1990. The non-convertible part of Rs. 60 will be redeemed in three equal annual instalments in 7th, 8th and 9th years from the date of allotment. Interest at 12.5 per cent will accrue from the date of realisation of the application money. The issue will open on September 27 and close on October 26.

Basic engineering for the sponge iron project will be done by Davy Dravo, a division of Davy McKee Corporation, US. The production of this import substitution item will save foreign exchange to the tune of Rs. 225 crores per year, Mr. Birla said.

Meanwhile, its turnover has jumped to Rs. 394 crores during the first five months (April to August 1989) from Rs. 310 crores in the same period last year and the gross profit has shot up to Rs. 50.25 crores during the period from Rs. 28.73 crores in the same period last year. The turnover for the whole of the current year ending March 1990 is expected to be in the region of Rs. 975 crores.

INDIA BUYS IRAQI SULPHUR

India has purchased one lakh tonne of Iraqi sulphur from the Trammo and Helm for shipment during October to December. Each sale of 50,000 tonnes has been agreed to at $83.25 per tonne F.O.B.

Minerals: GSI to step up survey

Geological Survey of India (GSI) will stantially step up its activity in the d season beginning October 1. Off-re and airborne surveys are to be ensified. Prospecting for minerals in ich the country is deficient and those ich are of strategic importance will accented upon by GSI.

The programme for the new field ason was discussed and approved by ntral Geological Programming ard, which met at Calcutta on Sep-mber 22, under the chairmanship of . P.K. Lahiri, Secretary in the partment of Mines in the Ministry of eel and Mines.

For geological mapping, the thrust ll be on the vast expanse of the eccan traps, other hard rock areas of ntral and western India and quarter-ry sediments of northern, eastern and stern plains so as to ensure 90 per nt coverage by the end of the Eighth an. Space imagery and air photo echanism are to be taken recourse to mapping the inaccessible areas of gher Himalayas.

As for airborne surveys, GSI is to gage its twin-otter aircraft for multi-nsor survey along vast stretches of rth-eastern and western India. An tensive programme for marine sur-ys too has been drawn up by GSI. Its ean-going vessel, Samudra Manthan, scheduled to undertake seven cruises cover 0.2 million sq. km. of seabed th the exclusive economic zone of dia. Two coastal research vessels, mudra Kaustubh and Samudra Saud-kama are to undertake 12 cruises to ver 3,000 sq. km. of inner shelf area.

In mineral exploration, GSI is to lay phasis on search and assessment of ditional prospects of basemetals, ategic minerals, fertiliser minerals, ld, diamond and platinum. The envi-nmental studies to be undertaken are include appraisal of natural resour-s of Gorakhpur district of U.P., effect dam construction on the Betwa River the southern U.P., preparation of o-environmental appraisal map of Rajasthan, drought problems of Sholapur district in Maharashtra, assessment of natural resources of Vijayawada-Guntur area in Andhra Pradesh and flood and erosion problems of Dhubri-Gauribari belt of Assam. Mr. Lahiri called upon GSI to make all-out efforts to prove economically viable deposits of coking coal, copper, zinc, lead, nickel, tin, platinum, gold and diamond.

S. INDIA RICH IN GOLD DEPOSITS: GSI

Hutti and Gadag belts of South India hold out prospects of gold with the grades ranging from two to nine grammes per tonne, recent work by the Geological Survey of India has indicated.

This was stated by Mr. P.K. Lahiri, Union Steel and Mines Secretary and Chairman, Central Geological Programming Board (CGPB), at the board's 24th meeting at Calcutta.

Better reserves have also been found in Utti, Sanbal and Tuppadhur blocks of Hutti belt and Sangli mine, Katti (north) and Sankodotak blocks of Gadag belt. Recent results from Ajjanahalli in Tumkur district have given enough indications of large tonnage low tenor gold deposits, Mr. Lahiri said.

Promising values have also been documented in course of the GSI exploration at Kempinkote in Hassan district of Karnataka, Surapalli sector of Kolar Gold Field and different blocks of Ramgiri belt, he added.

KAJARIA GROUP PLANS TO SET UP PIG IRON PLANT

Kajaria group, the parent company of Kajaria Ceramics Ltd. is planning to set up a Rs. 50-crore project for pig iron. The plant capacity is expected to be 2 lakh tonnes per annum. The house of Kajaria has for long been manufacturing and supplying grey iron castings for sanitary drains, like 'P' traps, gulley traps, sewer pipes, manhole covers, grates etc.

Company Notes

S.I. VISCOSE

South India Viscose will launch a programme of expansion at a total cost of Rs. 161.50 crores in the next 24 months. The company's managing director, Mr. G.S. Kesavamurthy, said the authorised capital would be increased to Rs. 50 crores from Rs. 20 crores. Whether it would be a rights issue or a public issue would be decided in due course, he said.

In-house expansion of Rs. 30 crores along with energy conservation worth Rs. 3 crores and the lignosulfonates subsidiary unit of Rs. 5 crores would be completed by March 1990. About Rs. 8 crores of the Rs. 33 crores to be invested in expansion and energy conservation will be work assigned to the SSIs of Coimbatore. "Coimbatore SSIs can do anything. Just give them the drawings. Getting it done by them will cost one third less and quicker than what it would be if we gave it outside", he said.

Pulp wood plant capacity is being increased to 50,000 tonnes a year from 42,000 tonnes and the rayon yarn capacity to 20 tonnes a day. Viscose staple fibre capacity is to go up to 50 tonnes a day from 30 tonnes a day. The three expansions will cost Rs. 30 crores. It is being financed from internal accruals.

For energy conservation the financial institutions are assisting the trend setting measure in Coimbatore. Obsolete equipment is being replaced and the saving by the conservation will be Rs. one crore a year.

For its biggest diversification, a caustic soda plant, the company is going to Maharashtra. It is not ony the concessions the Maharashtra government offers to units in backward areas but also the availabilty of stable power that has prompted it. Also, most of the raw materials are more easily available there as well as the market for caustic soda is better in western India than in the South.

The next big venture is with the Gujarat Industrial Investment Corporation for the manufacture of polymer and monomer, polyacrylamide and acrylamide respectively. It will be in a backward area of that state. The Rs. 25-crore venture will be completed in 20 months. GIIC will put up 12 per cent of the equity and SIV 40 per cent. There will be a public issue.

SIV has its own limestone quarries near Trichy and it is talking to foreign collaborators for the Rs. 1.50 crores venture to make burnt lime needed much by textile, cement and chemical industries. Tamil Nadu gets burnt lime from Andhra Pradesh. It will be a small plant to start with, 10 tonnes a day. Talks with a Denmark firm are in an advanced stage.

At Sirumugai the company will begin work in December on a 100 tonnes a day sulphuric acid plant. It will cost Rs. 6 crores. Mr. Kesavamurthy said the company is also looking at offers to set up pulp and VSF plants in the South East Asian countries.

The Australian partner for a large pulp and paper plant in that country is still to reply as he has not got the clearances at his end. Australia seems to be very circumspect about the environmental aspects of a pulp plant. Letters of intent for the titanium dioxide, yeast, VAM (vinyl acetate monomer) projects are awaited.

During the last few years the company has been recording one of the highest growth rates in the country. Turn over for the year ended March 31, 1989 has crossed the Rs. 100 crores mark to Rs. 103 crores, a growh of 43 per cent over the previous year's turnover of Rs. 72 crores. Gross profit has risen to Rs. 21.63 crores from Rs. 14.04 crores. Dividend has climbed to 35 per cent from 25 per cent. After providing Rs. 254 lakhs (Rs. 212 lakhs) for depreciation, Rs. 93 lakhs (Rs. 96 lakhs) for prior period expenses, Rs. 620 lakhs (Rs. 375 lakhs) for taxation, and after taking into account the transfer from investment allowance reserve Rs. 87 lakhs (Rs. 98 lakhs) and general reserve Rs. 93 lakhs (Rs. 96 lakhs) and balance of profit brough forward from last year Rs. 333 lakh (Rs. 147 lakhs) the amount available for appropriations is Rs. 1,709 lakhs (Rs. 1,062 lakhs).

The allocation to general reserve is 700 lakhs (Rs. 375 lakhs). Debenture Redemption Reserve gets Rs. 30 lakhs (same). Dividend absorbs Rs. 386 lakhs (Rs. 276 lakhs). The balance carried forward is Rs. 593 lakhs.

With the induction of professional management 3 years ago the company's turnover has climbed from Rs. 44 crores to Rs. 57 crores to Rs. 72 crores, and now to Rs. 103 crores. Profit has gone up from Rs. 3.50 crores to Rs. 21 crores in these three years. Shares were quoted at 230(100) and in these three years they have jumped to 900 and if past performance is any indication they will cross the 1000 mark this year.

HINDUSTAN ANTIBIOTICS PROFIT UP BY 71 PER CENT

The public sector enterprise, Hindustan Antibiotics Ltd. (HAL) located at Pimpri near Pune, registered an increase of 17 per cent in production at Rs. 91 crores and by 22 per cent in sales at Rs. 86 crores in 1988-89 over the previous year. This enabled the company to earn a net profit of Rs. 2.3 crores — a 71 per cent increase over 1987-88.

Production of penicillin touched 324 million mega units (MMU) compared with 265 MMU in the previous year which was a rise of 22 per cent. While production of gentamycin recorded a 173 per cent rise at 949 kgs. production

of vials and capsules was also the highest in the history of HA.

The labour productivity in terms of value of production per man per year was Rs. 3.45 lakhs during 1988-89 compared with Rs. 2.93 lakhs in the previous year. Factors responsible for the impressive performance are capacity upgradation of penicillin first crystals to 360 MMU a year, strain and productivity improvement in gentamycin production, increase of production capacity of capsulation by commissioning of high capacity capsulation machines, commissioning of blister packing machine and introduction of new products.

Trade sales increased from Rs. 9.2 crores to Rs. 17.2 crores showing a growth of 87 per cent. The company also introduced a number of energy saving measures like commissioning of energy efficient air compressors and chillers which resulted in reducing the cost of energy as a percentage of value of production to 17 per cent. A number of new formulations have also been introduced by the company and newer technologies are expected to be introduced in the near future.

HA is also setting up a formulation unit in Manipur state as a joint venture with the government of Manipur which will go a ong way in meeting the needs of north-eastern states. The company has obtained a strain from Panlab Inc., USA, which is under active implementation and there are plans to upgrade penicillin first crystals capacity to 400 MMU during the year 1989-90 and to 1,000 MMU by 1990-91.

The company has undertaken the capacity upgradation of gentamycin and has entered into an agreement with Pharmachim, Bulgaria which will increase the capacity to four tonnes per annum. HA will be able to meet almost the entire demand of the country.

HA is planning to increase the capacity of semi-synthetic penicillin from 35 tpa to 100 tpa and has plans to manufacture ampicillin sodium and cloxacillin sodium.

FACT RECORDS Rs. 36 CRORE PROFIT

The Fertilisers and Chemicals Travancore Limited (FACT) in Kerala, which was partially renovated, has turned out a record 112.96 per cent capacity utilisation in 1988-89 and has earned a profit of Rs. 36.45 crores during the period with a net profit of Rs. 5.97 crores.

The company, with its two plants at Udyogamandal and Cochin has produced 3,12,485 tonnes of fertilisers during the period, Mr. N.B. Chandran, chairman and managing director of the company said. Mr. Chandras, who has now been chosen to head another old and ailing government unit, the Hindu-

stan Fertilisers Corporation, said the company had achieved the highest turnover of Rs. 427 crores during the year as against Rs. 369 crores in 1987-88.

With the net profit of Rs. 5.97 crores, the company had been able to wipe out the balance of Rs. 2.93 crores in the accumulated losses over the last four decades, the report said. The company's Rs. 315 crores caprolactum project was in an advanced stage of construction and was nearing completion. Its 16 mw captive power plant had already been commissioned enabling the company to meet its power requirements.

FACT has submitted proposals to the government for new projects and schemes to be taken up during the next plant period envisaging a total investment of Rs. 974 crores. Half of the investment was meant for revamping and rehabilitating old segments. The Centre had already accorded clearance for the replacement of the company's ammonia plants at the Udyogamandal unit.

SYNTHETICS & CHEMICALS TO DIVERSIFY

Synthetics and Chemicals Ltd., presently the only manufacturer of SBR (synthetic butyl rubber) proposes to diversify into polystyrene, one of the lesser known plastics. The company has applied for permission to set up a 40,000 tonne unit at its Fatehganj complex in Bareilly district of Uttar Pradesh. The project is estimated to cost Rs. 46.90 crores.

Polystyrene is a transparent plastic used in the manufacture of bangles and other ornamental articles like flower vases. This polymer was almost facing extinction when it got a shot in the arm from the audio tape industry. Audio cassette is the largest market for polystyrene today.

Like all other plastics, polystyrene is also imported, the domestic production by two units — Polychem and Hindustan Polymers — being inadequate. Synthetics and Chemicals is already producing styrene, one of the raw materials used in the manufacture of SBR. Styrene is polymerised to produce polystyrene. The company has a licensed capacity of 24,000 tonnes of styrene. It proposes to expand the capacity to 80,000 tonnes at an estimated cost of Rs. 85 crores.

The proposed polystyrene plant will have an estimated turnover of Rs. 124 crores a year. The company hopes to raise money for this project through internal accruals, rights issue, of equity shares and borrowings (Rs. 1,055 lakhs), foreign exchange loans (Rs. 871 lakhs), rupee loans (Rs. 1,382 lakhs) and a debenture issue of Rs. 1,382 lakhs.

HARSHVARDHAN CHEMICALS

Harshvardhan Chemicals and Minerals Ltd. a three-year old fertiliser company, is diversifying into the manufacture of sulphuric acid and detergents in a big way. The company is setting up a plant for the manufacture of sulphuric acid with a capacity of 61,125 tonnes per annum. The plant would also be producing 5,000 tonnes of oleum-25 per cent. The total cost of the project is Rs. 12.85 crores. The company has obtained sanction for term loans aggregating Rs. 8.76 crores from ICICI, IDBI, IFCI and Allahabad Bank.

The detergent plant will be at a cost of Rs. 2.84 crores with a capacity to manufacture 2,37,500 tonnes per annum. The company has already commissioned the first phase of this project with an initial installed capacity of 33,000 tonnes.

To part finance this diversification programme, the company is coming out with a rights issue of fully convertible debentures of 14 per cent. The issue will be for 2,59,000 fully convertible debentures of Rs. 150 each for cash at par. The issue has opened on September 1 1989.

Each debenture will be converted int two stages. The first conversion will b after 12 months into 5 equity shares Rs. 10 each at a premium of Rs. 5 pe share and the second conversion will b after 18 months in the same manner

The company expects to achieve turnover of Rs. 30 crores in the curren year ending March 31, 1990. The turn over is expected to touch Rs. 200 crore when all these diversifications are com pleted.

HYDERABAD IND. MOVE TO SET UP POLYETHYLENE UNIT

Hyderabad Industries Ltd. is seeking clearance under the MRTP Act, to se up a polyethylene plant at Auriya i Uttar Pradesh. The Government has recently approved a petrochemical cracker project at Auriya, to be set up by Gas Authority of India Ltd. Hydeabad Industries, controlled by Mr. C.K. Birla, was one of the several contenders for the cracker project.

Hyderabad industries' latest proposal is for 1.6 lakh tonnes of linear low density polyethylene and/or high density polyethylene. The project cost is put at Rs. 350 crores. This is expected to yield an estimated annual turnover of Rs. 380 crores. The plant is also expected to produce 8,200 tonnes of butene-1.

If it gets approval for the project, Hyderabad Industries will be the fourth producer of polyethylene in India. Indian Petrochemicals Corporation, and Polyolefins Ltd. are already producing it, while Reliance Petrochemicals is putting up a plant at Hazira.

Hyderabad Industries now has a paid up capital of just Rs. 5.55 crores. It proposes to raise the project cost by "internal resources, foreign exchange loans/offshore export credit, debentures etc."

Highlights in Chemical Technology (Part 1)

DU PONT DEVELOPS INTERIM CFC BLENDS

In the race to find environmentally acceptable CFC substitutes, Du Pont appears to have stolen a lead with a range of three component blends claimed to have an ozone depletion potential only 3% that of CFC-12.

Though still at the development stage, the blends could prove a virtual drop in replacement for the ozone-depleting CFCs used to service existing refrigeration and air-conditioning equipment. If successful, the blends could result in a more rapid phase-out of the fully halogenated CFCs.

Candidate blend components include HCFC-22, HFC152∝ and HCFC-124. Blends could be on the market by 1990. The company stresses that the development of those blends will not affect its plans to start-up $ 25 million commercial plant for HFC-134∝ as the leading long term replacement for CFC-12 in refrigeration applications. (*Process Engg.*, 2/1989, p. 7).

A NEW ROOM-TEMPERATURE PROCESS TO COAT STEEL WITH DIAMOND FILM

An Australian high-school student (16 years of age) has developed a simple room temperature process to coat steel with a diamond film. The 16-year old student built an apparatus to coat stainless steel substrates in one minute with 0.5 μm diamond films by injecting an envelope of cool hydrogen around a jet of hot methane (the carbon source) into an oxy-acetylene plasma electrostatically and applied a voltage potential between the substrate and a steel chamber. The result was a harder and more wear-resistant surface.

The Australian student Andrew Good has a patent pending on his process which is described as a unique, fast room temperature process. The new process won for him Australia's Beyond 2000 Award in Science & Technology. (*C & EN*, 1/30/89, p. 5).

UNWANTED CHEMICAL REACTIONS & CHEMICAL ACCIDENTS

'Unwanted Chemical Reactions In The Chemical Process Industry' is the provocative title of B. Rasmussah's doctoral thesis (submitted to Riso National Laboratory, Denmark). She analysed 190 chemical accidents and reached the following conclusion for the distribution of causes:

Reactions initiated by stray catalysts and contamination	20%
Mixing the wrong chemicals	19%
Incorrect process conditions	19%
Use of the wrong temperature	19%
Insufficient mixing	13%

The remaining 10% included such factors as failure of auxiliary equipment, accumulation of reactants and delayed or sudden start of reactions. Almost 57% of the total number of accidents occurred on batch process operation, and 24% during holding or storage. Insufficient knowledge of process chemistry and thermochemistry was responsible for 34% of accidents, design error contributed to 32% and operator error to 16%.

Statistical analysis of events of this type can be debated and even faulted, but the study does highlight vulnerable areas of chemical process safety. *Chemtech*, 3/1989, p. 130).

LASER HARNESSED TO REALIGN POLYMER CRYSTALS

A laser beam can be employed to precisely realign crystals in polymeric materials, according to Ronald Salovey, Professor and Chairman of Chemical Engineering at the University of Southern California. The above research reported his findings at the annual mee ing of American Society of Plast Engineers last May.

The new laser technique is a improvement on oven heating for suc realignment. Conventional melting an cooling of semi-crystalline polyme such as polyethylene and polypropylen produce a plastic with random, sym metrical crystal spheres. If a sample i moved through an oven slowly, th crystal spheres elongate and align. Thi directional crystallization can improv such properties as tensile strength an stiffness. The laser method offers th advantage of being far more precise (*C & EN*, 5/8/89, p. 24).

THE WORLD'S FIRST CONTINUOUS AROMATIC FLUORINE INTERMEDIATES PLANT UNVEILED

A fully continuous aromatic-fluorine intermediates plant — the world's first was started up recently by Mallinckrod Specialty Chemicals Co. in St. Louis USA. The plant was designed by M.W Kellogg Co. (Houston, Tex).

Compared with batch routes, the technique has 30-50% lower capital costs and about 10-20% greater yield and fewer hazards, reports Mallickrodt's director for aromatic fluorine intermediates.

An aromatic amine (e.g. aniline) is reacted with hydrogen fluoride, in a reactor of proprietary design, to continuously make an aromatic fluorine via a two step process — diazotization of the amine, followed by decomposition of the diazonium salt to fluorobenzene. The latter step is exothermic and gives off nitrogen gas. Hazards are lessened because the process is carried out continuously, which reduces inventories of hazardous materials, and because it requires a smaller volume of raw mater-

als than a batch process for the same apacity plant. (*Chem Engg.*, 6/1989, p. 3).

DOW UNVEILS A NEW MEMBRANE SYSTEM FOR PRODUCTION OF 99.9% PURE NITROGEN

Dow's new membrane system for producing 99.9% pure nitrogen with recovery efficiency of 22% was reported in detail by John Jensvold (Senior Research Engineer with Dow Chemical) at a regional meeting of the American Chemical Society at Cleveland, Ohio, last May.

Traditional membrane units can economically produce purities of only 95% to 98%.

Dubbed Generon H.P., the air separation is said to be about twice as efficient as competing products at equivalent capacities. It will be marketed worldwide by Geveron Systems, established jointly by Dow and the BOC Group PLC for such applications as processing of specialty chemicals and food and beverages and for the heat treating of metals. (*Chem Engg.*, 6/1989, p. 17, *Ibid* 5/1988, p. 21).

WASTE-SITE DECONTAMINATION BY A NEW IN-SITU RADIO-FREQUENCY (IRF) PROCESS

A revolutionary proprietary process for the waste site decontamination in-situ based on radio-frequency was recently unveiled in USA. This waste-site decontamination by this new in-situ radio-frequency (IRF) process is much less costly than other treatment technologies — about $ 50-90/ton of soil vs about $ 200-300/ton for rotary kiln incineration and $ 100-140/ton for low temperature thermal treatment reports H. John Noland, Vice President of Roy F. Weston Inc. (West Chester, Pa).

Weston is about to commercialize the process, which was developed by Illinois Institute of Technology Research (Chicago). Decontamination is accomplished by inserting tubular, hollow-pipe electrodes into contaminated soil. The electrodes are excited with radio-frequency energy which heat the soil to 200-1000°F and vaporize hazardous contituents. The vapours are collected in the hollow pipes and routed to a vapour treatment system. (*Chem Engg.*, 6/1989, p. 17).

A LASER HEAT TREATMENT TECHNIQUE TO DEVELOP STRONGER PLASTICS

A heat treatment technique based on the use of laser could result in the development of stronger plastics. The technique was developed by polymer researchers at the University of Southern California (Los Angeles).

In the procedure a semi crystalline polymer is melted by slowly moving a laser across its surface causing the crystals to elongate and realign unidirectionally, rather than in the normal random fashion. This makes for greater tensile strength and stiffness. Other researchers have achieved similar property improvements by moving the material very slowly through an oven, but the laser can do the job about 100-times faster moving at about 25 micrometers/sec.

This is because the laser wavelength can be selected to ensure maximum absorption and heat conversion, and because the beam can be directed to align the elongated crystals in the desired direction. The California researchers obtained these results with polyethylene oxide, using a continuous-wave, tunable carbon dioxide laser. The researchers are now working with polypropylene. (*Chem Engg.*, 6/1989, p. 21).

INTERPRETIVE STUDY OF JAPANESE TECHNICAL DEVELOPMENT BEGINS IN USA

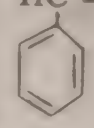
An interpretive study of Japanese technical development is the goal of KRI International Inc., a leading research and consulting institute in USA with offices in Kyoto, Japan, and San Jose, California. The technology translation and analysis programme, which will be disbursed as reports (rather than in electronic form), will cover Japanese developments in chemicals and semiconductors.

Less than 20% of Japanese patents, research briefs and documentation is translated into English at present, reports KRI.

According to US Patent & Trade Mark Office, Japan received twice as many US patent licenses as any other country. The project has already drawn such leading clients as Du Pont, Dow Chemical, Allied Signal and Shell Oil Co. (*Chem Engg.*, 6/1989, pp. 61-62).

POLYSTYRENE, THE MOST THOROUGHLY INVESTIGATED POLYMER SYSTEM IN POLYMER SCIENCE

The year 1988 was the 50th anniversary of the successful commercialisation of polystyrene in USA. The gigantic business that has developed for polystyrene, rubber-modified polystyrene (HIPS), acrylonitrile-styrene copolymers (SAN), and rubber modified acrylonitrile-styrene copolymers (ABS), originated with the simple addition polymerisation of styrene:



Styrene polymers have some unique properties which make them useful in a wide range of products. The single most important characteristic of general purpose polystyrene is that it is a glass-like solid below 100°C. Above this temperature, commonly called the glass-transition temperature, the polymer chain (on a molecular level) has rotational freedom, which allows large-

hain segment mobility. The polymer is hus fluid enough to be easily shaped nto useful forms. Below the glass-ransition temperature, polystyrene pos-esses considerable mechanical strength, llowing it to be used in load-bearing asks in thousands of applications.

Rubber-modified polystyrene is a wo-phase system consisting of a dis-persed rubber phase and a continuous polystyrene phase. This system uses a unique feature of polystyrene — elon-gation by the formation of energy-absorbing crazes. The dispersed rubber particles initiate large numbers of crazes without crack formation, thus contribut-ing to the development of very tough products.

In addition to toughening, the rubber particles also increase the environ-mental stress-crack resistance because the microscopic rubber particles are placed on tension as they are cooled after fabrication, compressing the rigid phase.

The particles try to shrink more than the rigid phase because rubber has a greater co-efficient of expansion than polystyrene. Modern micrographic and analytical tools have been developed to measure and predict the complex inter-actions of these two phase systems.

Styrene readily copolymerizes with a variety of other monomers. The first well-known copolymer was styrene but-adiene synthetic rubber. Other signifi-cant copolymers include tough, solvent resistant copolymers with acrylonitrile; heat-resistant polymers with maleic anhydride; and rubber-modified trans-parent systems with methyl methacry-late. Although there have been many studies concerning multiple (more than two) comonomers, few significant commercial products exist.

Since styrene polymers are non-polar, chemically inert, resistant to water and easy to fabricate, they are the products of choice for electronic, medical, food packaging, optical appliances and auto-motive applications.

Recent manufacturing trends provide improved processability and further decrease trace impurities. High speed efficient fabrication equipment is both reducing the cost to manufacture and increasing the strength of the fabricated parts.

Polystyrene molecules can be ori-ented during fabrication. Modern pro-cessing equipment uses controlled orientation to produce tougher fabri-cated parts. Tensile strengths may double and elongation may increase by up to two orders of magnitude, result-ing in tremendous increases in tough-ness. Toughening by orientation contributes to the success of polystyrene foam, now widely used in both insula-tion and as a foam sheet in food pack-aging and to the success of clear thermoformed biaxially oriented poly-styrene.

Use of styrene polymers in packa-ging is enhanced by their resistance to gamma radiation with 20 to 30 kGy (2 to 3 Mrad) range used for sterilization. Pure polystyrene does not absorb U-V light in the terrestial sunlight spectrum and would apparently have better U-V stability if it were not for the presence of U-V absorbing trace impurities.

The presence of rubber tends to decrease the outdoor stability; this is countered by incorporating special rub-bers and stabilisers. Anionic polymer-isation produces a more thermally stable polymer which can be made even more stable by proper selection of the end group because most degradation begins at chain ends.

Because of the commercial interest in polystyrene, its polymerisation ease, and its relatively simple linear structure, polystyrene is one of the most thor-oughly investigated polymer systems in the world. (Encyclopedia of *Polymer Science & Engineering*, (Vol.16) p. 4, John Wiley & Sons, New York).

A NEW MOLECULAR SIEVE DEVELOPED TO EXTRACT LITHIUM FROM SEA WATER

There are more than 2.5 trillion tons of lithium in the world's oceans. The only problem is how to extract it econo-mically? Researchers Y. Ooi and S. Katon think they have the answer. Ab-sorb it with a new type of molecular sieve prepared by the acid treatment of magnesium magnatite. Molecular sieves for the adsorption of alkali metals are not new, but this one has unusually high selectivity for lithium in the presence of other alkali and alkaline earth metals, concentrating lithium in seawater by a factor of 26,000. The key to its high selectivity is magnesium, which has an ionic radius nearly equal to that of lith-ium. (*Chemtech*, 3/1989, p.p 190-91).

THE WORLD'S FIRST ELECTRIC GENERATOR FROM HIGH TEM-PERATURE SUPERCONDUC-TORS

British researchers have built what they claim to be the world's first elec-tric generator based on high-temperature superconductors. At the heart of the generator is a coil of superconducting wire made from yttrium, barium copper oxide. The generator produces a volt-age of 2.5 volts when the coil is spun at 1500 revolutions per minute. Accord-ing to one of the developers Neil Alford of ICI Advanced Materials in Runcorn a great deal of work needs to be carried out before high-temperature supercon-ductors can be used to generate electric-ity on a commercial bases.

The problem at present is that high temperature superconductors can only carry relatively small amounts of cur-rent. If researchers succeed in raising the current carrying capacity of these mater-ials, they can be used to make gener-ating power far more efficient, and reduce the price of electricity. (*New Sci.*, 6/10/89, p. 34).

Science Briefs

CEERI TECHNOLOGY FOR SUGAR INDUSTRY

The Central Electronics Engineering Research Institute, Pilani, has developed an integrated microprocessor-based automatic centralised industrial temperture indicating, monitoring and controlling (teimac) system for energy economisation and process optimisation for sugar and allied industries.

In a sugar industrial unit producing 100 tonnes of mixed juice per hour, the cost of heating the mixture by 1 degree Celsius works out to be about Rs. 50,000 per season. By accurately monitoring and controlling the temperature using the Micro-teimac system developed by CEERI, it is now possible to save lakhs of rupees per season and the process performance can also be improved. The system can be used in other allied industries also, according to a CSIR newsletter.

With the growing awareness for making the best use of the available energy sources, instruments/systems for energy conservation and efficient use are becoming increasing popular. Micro-teimac, developed at CEERI with financial support from the Department of Electronics, though specifically meant for the sugar industry, is equally well-suited to other process industries such as cement, food, textiles and petrochemicals.

A low-cost system that is appropriate for Indian conditions the Micro-teimac consists of five sub-systems —a digital industrial grade temperature indicator, a multichannel scanner unit, a monitoring panel, a microcomputer and a 16-channel micro-controller.

A unique feature of the Micro-teimac system is its 16-channel controller which provides 4-20 mA control signals for the control of 16 process steps. The signal can be used either for manual control or automatic control and for records. The output signal of the controller can be used for the control of control status and the deviation indicator, stepper motors or electropneumatic valves.

The digital thermometer uses a thermocouple as a sensor. A reference junction is combined with it if it is used as stand-alone, otherwise it is combined with the scanner unit. A novel and patented digital linearizer is incorporated after the analog-to-digital conversion.

The multichannel scanner unit scans microvolt signals of all thermocouples using zero thermal offset reed relays. It has a provision for scanning 24 channels which can be easily extended to 100 channels.

The continuous display of each process parameter of all the 24 channels is provided on the monitoring panel.

In a sugar factory, the juice is heated up at several stages and so the financial benefits which can be drawn by employing accurate and reliable instrumentation is manifold. Field trials showed that use of the Micro-teimac system led to more than 2 per cent energy saving.

-- PTI Science Service

CEMENT FROM RICE HUSK ASH

The idea of using rice plants to construct buildings does not stem from a fertile imagination, but the discovery that rice husk ash can be used as a raw material for manufacturing cement.

Nearly half to two-thirds of the investment in developing countries goes into buildings and construction work, and about 60 to 70% of this investment is accounted for by building materials and components alone, a survey has shown. Thus, depending on the stage of development, about 4 to 12% of the Gross National Product (GNP) is devoted to the production of building materials and components, which indicates the crucial role of building material industries in the growth process.

For some time now, the cement industry in the developing countries has been unable to meet the demand for cementitious material, partly due to low capacity utilisation, fuel and power shortage, transportation bottlenecks and lack of funds.

Developing countries are therefore attaching considerable importance to the introduction of new technologies for production of new types of cements and cement substitutes at a low cost. One such promising technology developed in recent years involves the production of cement from rice husk ash.

Rice husk is a major agricultural by-product of the paddy crop, constituting nearly 20% of the total crop. Owing to its low bulk density, harshness, slow rate of biodegradation and high silica content, it has little traditional use in the countryside as fodder,fuel or a source of manure.

Rice husk contains 16 to 18 per cent pure silica by weight, and on burning yields 20 to 25% ash with more than 90% amorphous silica. Silica is an important and essential component of most of the present-day building materials like bricks and cements and of a variety of pozzolanas and sand-lime bricks.

Studies show that rice husk can be used as a raw material for manufacturing cement-like materials, boards for roofing and partitions, as a source of silica for the manufacture of sodium silicate, filler for rubber goods, silica cored pigments, pure silica, special bricks and insulating bricks, as well as chemicals like furfural.

Basically two broad categories of

technologies are available: 1) controlled combustion of rice husk and mixing and grinding with lime, and 2) mixing or grinding ash available from boilers in rice mills with lime or calcined lime sludge and then grinding the mixture.

Highly reactive silica can be obtained from rice husk, either by controlled burning of the husk in a temperature range of 450 to 700°C, or by extensive grinding of the ash obtained from burning the rice husk in a wider temperature range. While silica produced by controlled burning is amorphous in form, more crystalline forms of silica are formed if the temperature of combustion exceeds 700°C. Studies also indicate that the reactivity of the ash is reduced by the presence of these more crystalline structures. The reactivity of the ash is also related to its surface area.

Scientists have listed six classifications of cementitious materials using reactive silica. These are 1) blended lime-rice husk ash mixtures, 2) interground lime-rice husk ash mixtures, 3) limestone-rice husk mixtures which are fired together and ground after calcination and ash production, 4) blender lime rice husk ash mixtures which are mixed with certain bauxite clays like illite and kaolinite, 5) blended portland cement-rice husk mixtures and 6) interground portland cement-rice husk mixtures.

Studies at the Cement Research Institute of India, New Delhi, as well as in the United States and Australia also confirm that substantial amount of cement can be replaced by ash, without any significant effects on long-term strength properties.

A wide range of cementitious materials based on rice husk can be developed to suit different needs, ranging from plastering materials to acid-resistant, high-strength concrete, the particular nature of the raw materials, for example, the form of lime (whether it is limestone to be calcined, partially slaked or unslaked lime, or lime sludge), the temperature of ash conversion, the degree of grinding, the mixture properties and curing conditions.

The end-product, sometimes referred to ASHMOH cement, is similar but not identical to ordinary portland cement, and it can replace building material applications. It differs from portland cement in setting times and strength.

In rice husk ash cement, lime content is only half that of Portland cement, which imparts a superior resistance to chemical corrosion in the former. It has been successfully used for making gobar gas plants, grain storage silos, semi-circular pipes for irrigation canals, sand-cement blocks, tiles and bricks.

Production of cement-like materials from rice husk, ash offers several advantages. Firstly, the problem of disposal of large quantities of rice husk dispersed over a wide area would be solved. Secondly, a material for providing one of the basic needs -- shelter -- will be produced. Thirdly, such an industry would have to be established on a small-scale or cottage industry basis (as rice milling is done mostly in the cottage and small-scale sectors) and will, therefore, not only be capital intensive, but also provide employment opportunities.

The technology has other plus points too. It can be operated in a large number of decentralised small units, its production cost is low, it is labour intensive and uses a raw material as its main raw material input.

The technology is cheap, requiring only rice husk ash and lime, as raw materials. The process requires, in all, a single grinding operation only in a ball mill, a relatively cheap and exceptionally rugged piece of equipment that requires little maintenance.

Ideally suited for agro-based industries in rural and backward areas, rice husk ash plants are economically viable, available in sizes with as low as 30 tons per annum capacity. The capita cost for putting up such a plant is abou one-third to one-fifth of that of an inte grated cement plant of the same capac ity. The cost of rice husk ash is nearly one-third that of portland cement.

It should be recognised, however, that while the technology exists for utilisation of rice husk as a cementitious material, certain gaps exist in the fundamental understanding of the nature of the reactivity of the ash, the kinetics of the chemical reactions involved and most aspects of the long-term behaviour of materials made from rice husk ash.

While the ash percentage derived from the husk varies between 18 and 30%, the physiochemical composition of the ash is influenced by the rice strain, soil and climatic condtions.

Many countries in Asia, including India, Pakistan, Bangladesh, Nepal, Sri-Lanka, Indonesia, Malaysia, Thailand, the Philippines, and South Korea, as well as Australia and the United States are conducting extensive studies in this field to provide a viable alternative to building material shortage.

-- PTI Science Service

PHEROMONES: SEX TRAPS FOR PESTS

Insects are the number one enemy of the poor Indian farmer, ravaging his fields and generally making his life miserable. Although several insecticides developed over the years brought relief to him, yet the pests seem to have an uncanny knack of overcoming these insecticides. Simultaneously the costs of these chemical insecticides are becoming prohibitive.

Faced with the challenge of evolving cheaper and more effective methods of controlling insect pests, scientists have hit on an exciting new route — using sex pheromones to play Cupid in luring

insects to a trap and subsequently killing them.

The idea of using pheromones as a natural method of checking insects was borne out of painstaking observations on insect populations, their social habits and the reasons for their proliferation in short time-spans. In course of time it was found that pheromones played an important role in an insect's life cycle.

What is a pheromone? It is the natural body scent that most insects secrete to attract the opposite sex before mating. In broader terms, pheromones are chemical substances secreted by animals, to evoke specific response or behaviour from other members of the same species.

While the mode of communication differs from species to species, insects on the same species communicate with each other through pheromones.

In general, sex attractant pheromones are produced and emitted by female insects or animals to lure the males. There are a few exceptions to the rule, however, one being the boll weevil where the male emits the scent.

The chemical nature of sex pheromones was first recognised by German scientists during the 1950's in the female silk moth, Bombyx mori. They called it Bombykol. Since then, researchers have succeeded in isolating pheromones from beetles, cotton boll weevil and bumble bees. The word pheromones seems to have been coined due to the similarity between the chemicals and hormones that are secreted in the human body.

Using this knowledge scientists at the Institute of Chemical Technology (ICT), Hyderabad (formerly RRL), have developed pheromones to specifically check the spread of bollworm that is playing havoc with the cotton crop.

The scientists have demonstrated in field trials the efficacy of pheromones as insect traps and have been able to determine the exact amount of pheromone needed in a particular field to destroy a particular pest.

These non-toxic chemicals can be turned into handy tools for monitoring pest populations. The use of harmful pesticides could be rationalised and indiscriminate spraying of toxic chemicals minimised or avoided, said Dr. A.V. Rama Rao, Director of ICT. "We have developed technologies to formulate pheromones to fight different pests as well", he added.

The institute has a readymade system to control pests affecting the cotton crop. The main pests of cotton are the sucking pests and boll worms. While sucking pests can be easily controlled by the use of insecticides, it is quite difficult to halt the spread of the deadly boll worm.

There are five types of bollworm that bring huge losses to the cotton crops: spotted, spiny, pink, heliothis and the army worm varieties. By using pheromone traps, it is possible to check the enormous damage that these insects can cause to the crop, the scientists claim.

The requirement of pheromones in the country at present is only a few kilograms, while it is known that the cotton crop alone consumes more than 50% of the total pesticides used in agriculture, especially in Maharashtra, Tamil Nadu, Andhra Pradesh and Karnataka.

The Government of India has recognised the need to use pheromones as a measure to control insect pests infesting cotton crops. Under the intensive cotton development project, central assitance is being given to all cotton-growing states for application of pheromones.

A beginning has been made in the states of Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu, where cotton is an important crop, and the damage wrought by the white fly and boll worm has been found difficult to control.

Pheromones have to be used only in small quantities to get effective results. About 12-15 mg is applied per acre of land. As they are non-toxic and used in such small doses, they do not pose any environmental problems, scientists say.

-- PTI Science Service

TANNERY EFFLUENTS USEFUL FOR FODDER CROPS

A recent study conducted in Madurai district of Tamil Nadu indicates that treated industrial effluents from tannery units can be used to raise good fodder crops.

The study, conducted by the Agriculture College and Research Institute of the Tamil Nadu Agriculture University, found that while the quality of well water near the pollution source deteriorated, the effects of treated effluents were positive on the soil quality.

A pot culture experiment was conducted with a test crop of ragi in two soil series — Irugur and Palathurai — which occupy major areas in Dindigul Taluk of Madurai district.

The crop was treated at four irrigational levels with tap water, 25% tannery effluent, 50% tannery effluent and 100% tannery effluent. The crop was also treated with varying percentages of gypsum added to the effluents.

The study revealed that irrigation with increased concentration of effluent significantly increased soil pH, electrical conductivity, organic carbon and other minerals. Irrigation with 25% effluent along with addition of gypsum was found to be the best in recording the highest straw yield.

Irrigation with increasing concentration of effluent increased nitrogen, pho-

sphorus and sodium contents. Irrigation with 25 and 50% effluent influenced the nutrient uptake by ragi straw. Based on findings of the study, researchers suggest that irrigation with water having 25% of tannery effluent could be used for raising a good ragi crop. Similarly irrigation with 50% effluent content and with treated effluent only could also give luxuriant foilage growth in ragi crop. Tannery effluent can also be used as a profitable irrigation medium for growing grasses like Giant Napier, which have proved a success under sewage irrigation. The application of gypsum followed by pressmud also proved effective in increasing available nutrient status of the soil and plants. (DCS).

-- **PTI Science Service**

SYNTHETIC APERTURE RADAR SURVEY FOR OIL EXPLORATION

The Oil and Natural Gas Commission (ONGC) recently used a novel remote sensing technique, the synthetic aperture radar (SAR) survey, to explore the oil and gas potential of the Andamans Basin which is normally enveloped by dense clouds.

SAR involves imaging in the microwave region of the electromagnetic spectrum. The most important reason for using microwaves is their capability to penetrate clouds and rains. They can be used during both day and night and in all kinds of weather.

Potential applications of the technique include geological mapping, terrain evaluation, hydro-geological studies, monitoring oil spills and wave pattern in oceans, agricultural and forest conservation practices.

This survey, according to ONGC sources, will help in understanding the Andaman basin where all efforts to obtain remote sensing data from other methods could not succeed due to dense cloud cover. The SAR technique is expected to yield valuable information, which when integrated with other data, including drilling data, will help in proper evaluation of the basin and identifying oil prospects.

The remote sensing technique is specially useful in identifying geomorphic anomalies and buried structures, which are difficult to locate by conventional seismic survey techniques.

-- **PTI Science Service**

IMPROVED OIL EXPELLER FROM MERADO

A prototype of an improved oil-expeller has been designed and developed at the Mechanical Engineering Research and Development Organisation (Merado), of the Central Mechanical Engineering Research Institute, Ludhiana.

Most of the 36,000 odd oil-expellers now in use in the country have frequent breakdowns and consume more power. The oil content of the cake produced in these expellers ranges from 8 to 12%. The high content of residual oil is attributed to inefficient design, poor manufacturing technology and use of low-grade materials.

In order to increase the amount of oil expelled, a project for development of a modern oil expeller with a crushing capacity of ten tonnes per day was undertaken at Merado as part of the technology mission on oilseeds. The prototype developed at Merado leaves a residual oil of 4 to 6 per cent in the cake and consumes less power than the expellers now in use.

-- **PTI Science Service**

NEW ANTIRABIES VACCINE DEVELOPED BY GENETIC ENGINEERING

Indian scientists have developed a new antirabies vaccine by genetic

engineering and successfully tested it on laboratory animals. The vaccine made by altering the genetic structure of a virus called "vaccinia" has protected mice from the deadly rabies, scientists from the National Institute of Immunology (NII) said.

Reporting their work at an Indo-french colloquium on life sciences here the NII team said mice immunised with the new vaccine and then challenged with virulent rabies virus were "100 per cent protected."

"We have made good progress and laboratory tests will be extended to dogs over the next few months", Dr. G.P. Talwar, NII, Director and team leader said. Rabies, caused by a bullet-shaped virus that attacks nerve cells, kills nearly 20,000 people in India every year and National Institute of Communicable Diseases experts estimate about 500,000 others have to undergo the painful course of antirabies injections following dogbites.

The biggest advantage of the genetic engineering approach would be the low cost and easy delivery perhaps even through the oral route, Dr. Talwar said. Preliminary studies indicate that the efficacy of the oral route is nearly 80%. But this could be increased with dose modifications, an NII team member said.

The new vaccine called "Vaccina rabies glycoprotein vaccine" (VRGP) works by using the genetically transformed vaccinia virus itself as the vaccination. This is achieved by inserting the gene that takes part in the manufacture of the glycoprotein coat of the rabies virus into the genetic structure of the vaccinia virus.

When the altered vaccinia virus is inserted into test animals and the gene is successfully expressed, the animals develop an immunity to the rabies virus. Dr. Talwar said if laboratory trials on dogs are successful, the vaccine could be used to immunise stray dogs in the country which are believed to be primary sources of the rabies infection.

India has a dog population of about 18 million and nearly 90 per cent have been categorised as stray dogs. The vaccinia virus which the NII team used to make the new antirabies vaccine has been used for decades by doctors to immunise people against smallpox.

This has raised hopes of using such a genetically engineered vaccine on humans too but, researchers caution, any such move would be preceded by extensive safety studies through field trials on animals.

Conventional anti-rabies vaccines are made from infected animal brains or through tissue culture techniques. (GSM).

-- PTI Science Service

SAW SENSORS FOR NEW GENERATION OF CHEMICALS DETECTION DEVICES

In a joint project with the Delft University of Technology, the TNO Prins Maurits Laboratory has developed a Surface Acoustic Wave Sensor for detecting nitrogen dioxide. This sensor may be considered an important step forwards a new generation of chemical microsensors for detecting chemicals in the atmosphere, reports "Applied Research".

If there is a danger of people being exposed to toxic compounds (chemical warfare, industrial calamities, natutral disasters), it is necessary to warn them in time. In this regard a distinction is made between devices that give off a warning when hazardous concentrations of toxic compounds are exceeded, and means that enable the nature of the compounds to be determined and thus supply physicians and commanders with necessary information.

The TNO Prins Maurits Laboratory has been working for a number of years on the development of chemical microsensors. Chemical sensors can be used

to transdue chemical signals (the presence of concentration of a certain substance) into suitable electrical signals. They are used for the identification of toxic, corrosive and explosive compounds (alarm and detection), or for the checking of process variables in chemical processes.

In the last decade, much research has been conducted into miniaturization for the production of microsensors. Chemical microsensors are mostly based on IC technology, where the sensor and the electronics are integrated on the same silicon chip. Apart from the fact that they are small and use little energy, microsensors have the advantage of being robust and reliable. Furthermore, the fact that they can be mass-produced means that they are low in price.

After an extensive analysis of the various existing sensor systems which could be used in miniaturized alarm and detection systems, the TNO researchers decided to work on the basis of Surface Acoustic Wave (SAW) technology.

An alternating electrical field is generated on a piezo-electric substrate material (quartz) with the aid of two interdigital aluminium electrodes. A synchronous mechanical deformation of the substrate material is thus produced. If the correct crystallographic direction of the piezo-electric material is used, an acoustic wave is created which, under certain conditions, is restricted to the surface of the substrate material — the Surface Acoustic Wave. The second identical set of electrodes, at a distance of approximately 8 mm, acts as a receiver. The combination of the transmitter, receiver and the wave path which lies between them is called a delay line.

Any change in the wave path between the transmitter and receiver affects the propagation speed of the wave and this can be measured very accurately as a frequency change. Such a change may manifest itself as a change in mass. Use is made of this phenomenon by means of a so-called SAW sensor.

The surface between the transmitter and receiver has a chemically reactive layer, which selectively absorbs a specific particle from the atmosphere, thus causing a change in mass. The reactive interlying area is called the chemical interface. One requirement is that the gas is released again as soon as the atmosphere is clean. Heavy demands are placed on the choice of material due to the selectivity referred to above as well as the stability and reversibility required.

The advantage of the acoustic principle is that a simple change in mass, which happens with almost every chemical interaction, is sufficient to form a signal. Thus, each chemical interaction which gives the desired selectivity is suitable, and a choice can be made from a range of chemical and biological substances when developing the chemical interface.

The researchers succeeded in placing the sensor, together with the processing electronics, onto a small chip. In order to become familiar with the knowhow of this new generation of sensors, work was first carried out on a sensor for nitrogen dioxide. For this sensor, which has been patented, phthalocyanines were used as a chemical interface. Various aspects of the sensor were examined, such as selectivity, speed, stability, the effect of the way in which the chemical interface was applied, the thickness of the chemical interface and chemical changes in the phthalocyanines, as well as the effect of temperature and frequency.

The sensor appeared to be selective with regard to nitrogen dioxide in the presence of a number of other gases such as methane, carbon dioxide, carbon monoxide, water, sulphur dioxide, ammonia and toluene. The researchers also found that, in the applications of the chemical interface, chemical bonding is to be preferred to physical application (smearing, spraying, steaming) because of the eventual stability and speed achieved. Sensitivity does decrease, but

this can be compensated by selecting a higher sensor frequency.

The researchers are currently working on the primary aim of their project, the development of a sensor (chemical interface) for chemical weapons. Most weapons differ clearly in a toxicological sense from other organics compounds. In the chemical sense, however, the opposite is the case. This makes the discovery of a suitable chemical interface for these chemicals no easy task. However, with the development of the nitrogen dioxide sensor, it seems that an important step has been made towards the development of a sensor for chemical weapons.

-- PTI Science Service

NOISE USED FOR THOROUGH CLEANING

Scientists in the German Democratic Republic have devised a novel technique that uses noise or high-intensity sound to clean large boilers while in service.

Scientists at the Academy of Mining and the Halle Electric Energy Combine pooled their efforts to devise a novel process, called the acoustic cleaning technique that involves exposing the flue gas flowing through the tubes of heat exchangers that form part of steam generators in power stations to high sound levels. The high-intensity sound is generated by means of tyfons (high-capacity sound transmitters which are operated with compressed air).

The intensity of the sound waves is comparable to the noise generated by an aeroplane during take-off. The noise causes additional movements which carry along ash particles which were deposited on the surfaces of the heat exchanger, but were not yet firmly attached to them.

If this "acoustic irradiation" is repeated periodically, for instance every five minutes, with an exposure time of 10 seconds, as particles are removed before they settle down, bake together and scorify.

The advantage of this technique is that the steam boiler need not be put out of operation for cleaning. Furthermore, inspite of the high-intensity sound waves, acoustic irradiation consumes little power and can be carried out by automatic devices.

This technique is a great economic asset for the GDR, since more than 80% of all electric power is generated by burning lignite in steam boilers. Ash and other residues rapidly clog up the ducts of these boilers.

The flue gas then escapes into the atmosphere, after by-passing electrofilters, without heating the water flowing through the pipes of the boiler. Because they are clogged up, boilers in power station means heavy physical and dirty work for the boiler cleaners.

The accoustic cleaning process makes frequent manual cleaning superfluous. The working life of a boiler is increased by 30 to 80, occasionally by as much as 200%. It is obvious that costs are cut too. The emission of high-intensity sound to the flue gas flow does not negatively affect the boiler operators, since the sound sources emit the sound into the interior of the steam boiler. Thus only the inside of the flue gas ducts is exposed to high sound levels.

Besides, the boiler is enveloped by a jacket consisting of brickwork, insulating material and layers of other materials in order to enhance its thermal insulation and its stability. This means that only strongly muffled sound is heard outside the boiler.

Experts have thoroughly studied the distribution of noise in a boiler house during the operation of acoustic cleaning equipment. They established that this equipment does not exceed the sound pressure level that is permissible under the German Democratic Republic's strict regulations on industrial safety.

A NEW PROCESS FOR GRANULATING FERTILIZER

A new process for granulating fertilizer that can operate on a continuous basis and reach higher levels of productivity with a narrow granulometric spectrum, was recently developed by the French company, Extramet Industrie.

The principle, on which the process is based, consists in causing a liquid jet of material to vibrate, thereby cutting it into identical volumes that become spherical before solidifying as they cool and drop.

The equipment marketed by Extramet Industrie entails a large-volume granulation device (called a "shower") that can be adjusted to replace traditional granulation showers. This shower includes a circular, slightly convex plate, through which a large number of holes have been drilled. The unit was designed to eliminate the risk of there being any turbulence in the flow of the liquid that is to be granulated.

This would otherwise prove to be quite detrimental to the breaking-up and stability of the liquid jet. Each shower is equipped with a 40-Watt electromagnetic vibrator. The entire unit is powered by a frequency generator, located in the control room.

The showers are set in a vertical position and the double-shelled ducts that ensure a steady feed of the solution are quite large in diameter (100 mm). The ducts and showers can be cut off by means of a series of valves. They are also equipped with blow-off valves for outgassing.

These features offer clear advantages as compared with traditional equipment. The finished products are extremely regular (granulometry of between 2.15 and 4 mm) and do not need to be recycled. There is no buildup of fertilizer on the walls of the tower or on the holed plate.

This eliminates shut-down cleaning time. The rate at which the section of the tower can be refilled is optimized by the vertical arrangement of the showers. The cooling system has been improved, as well as the stability, automation and continuous operation of the process.

-- PTI Science Service

FOUR-INCH DIAMETER DIAMOND THIN FILM

The National Institute for Research in Inorganic Materials of the Science and Technology Agency in Japan has succeeded in making diamond thin film which has a diameter of four inches, reports "Techno Japan".

Methane gas at less than 1 per cent concentration was used for the raw material, and a plasma generated at 800 degrees Celsius to 900°C by microwaves at about 500 Watts power, to form diamond in the gas phase on a silicon substrate under pressure.

Two microwave generators of 1.5 kw power were used together in the horizontal direction. A system has been developed to control the position of the plasma generated by controlling the power of each microwave generator and a large area of diamond has successfully been obtained.

The plasma has 30 mm width and 150 mm length and moves in the direction of width. The diamond thin film could be manufactured at the growth rate of 0.2 micrometers per hour by using a gas flow of 100 to 200 cubic centimeters per minute.

It is a multiple crystal having 3.52 specific gravity and 8000 kg per square centimeter. The film thickness is even and the product can be reproduced.

-- PTI Science Service

Bromine Industry in India — A Review

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ntroduction:

Sea water, as everybody is aware, is a storehouse of a umber of inorganic chemicals. Amongst them, bromine was ne first chemical to be recovered commercially with the xception of salt which has been harvested by man since the awn of history. Bromine was first discovered by A.J. Balard in 1825 while working with end liquor obtained after ecovery of salt and about 1850 he developed a process for ne production of sodium sulfate, potassium chloride and nagnesium chloride by fractional crystallisation of the residal bitterns from French sea-salt works. This process is posibly the first leading to recovery of marine chemicals in salt vorks and hence Ballard can be called as the originator of narine chemicals recovery complexes.

Two separate and distinct processes (commonly known as ir-blowing and steaming out) for the production of bromine vere developed around the same time. The Dow process (air lowing) in which, after acidification and chlorination of sea vater, air is used as stripping agent, was developed by H.H. Dow in 1896. The steaming out process in which liberated romine is stripped with steam, was improved and made vorkable by Kunrad Kubierschky in 1906 in Germany.

The air-blowing process is normally used for recovery from ea water (bromine content 60 to 70 mgm/lit) and the other : adopted for sources having bromide content higher than gm/litre. These two processes are still in use and the changes ney have undergone are mainly with respect to materials of onstruction and a few improved design of the equipments.

ndian salt industry and bromine recovery:

India is one of the major solar salt producing countries in ne world with an output of more than 10 million tonnes per nnum. In the initial years M/s. Tata Chemicals Ltd., Mithpur produced marine chemicals like potassium chloride, agnesium sulfate alongwith bromine from bittern. Neglecting the small amount of magnesium compounds produced om bittern, bromine is the only by-product presently produced indigenously in Indian salt industry including M/s. Tata hemicals Ltd. The technology required for indigenous production of bromine from bittern was developed by both Govnment and private R & D institutions. Adoption of r-blowing principle for recovery of bromine from bittern us been successfully achieved in our country.

The status of bromine industry in India is given in Fig.1 d 2 and Table 1 gives the projected demand. The data esented in figures and table is based on the information provided in the Annual Numbers of **Chemical Weekly**. Based on this data following inferences can be drawn.

Table 1
Projected demand of bromine in India

Year	1984 to 1985	1985 to 1986	1986 to 1987	1987 to 1988	1988 to 1989	1989 to 1990	1999 to 2000
Demand in tonnes	1000	1050	1100	1160	1220	1280	2100

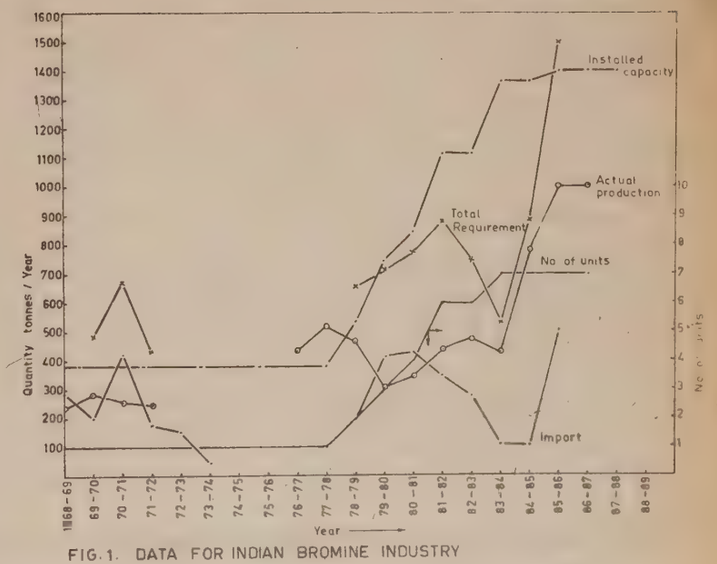

FIG. 1. DATA FOR INDIAN BROMINE INDUSTRY

Fig. 1. Data for Indian bromine industry

1. The increase in indigenous production is observed after 1977-78 when indigenous technology was available for exploitation.

2. The gap between the present installed capacity and the projected demand for the year 2000 is 700 tonnes.

3. The capacity utilisation factor during last 10 years varied between 30 to 70%. This is mainly dependent on availability of basic raw material, namely, bittern from the salt works and its appropriate storage. It is also affected by frequent disruptions in electrical supply in coastal areas.

4. The total annual requirement of bromine in our country, based on import and production figures, has reached about 1,500 tonnes in recent years. The expected production during 1987-88 is reported as 1,500 tonnes. Accordingly the installed capacity will have to be increased by about 60% by the year 2000.

5. The imported cost of bromine (without duty and taxes) varied between 40 to 65% of indigenous cost of production over the last 10 years. Fig. 3 gives the variation in market price of bromine (as reported for 1st week of December of particular year) over the last 15 years (value for 1989 is the figure for July '89). It appears that the market price is controlled by import cost. For imported bromine duty charged is 100% in addition to a fixed charge per kg.

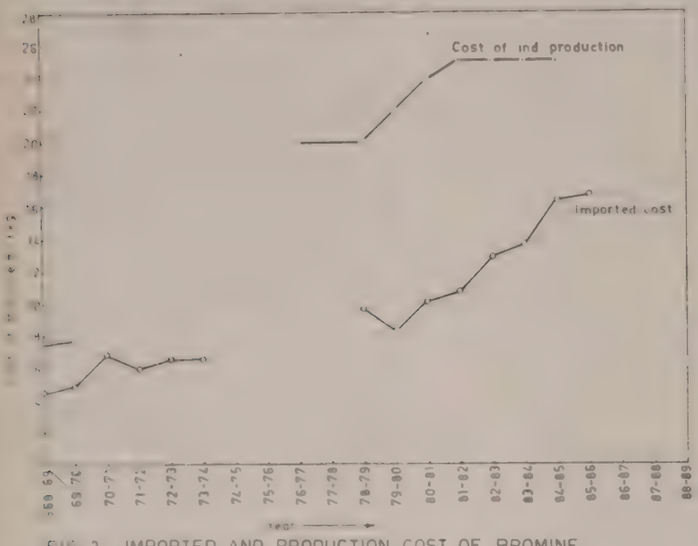

FIG 2 IMPORTED AND PRODUCTION COST OF BROMINE

Fig. 2. Imported and production cost of bromine

Before discussing the future plans for bromine industry in our country, the noticeable developments reported from abroad are mentioned.

Developments in technology for bromine recovery:

The recent report (1) indicates that the total annual production in 1987 of bromine in the world is about 4,00,000 tonnes and Isreal produced nearly 25% of it as the present leading manufacturer, the position, which was enjoyed by the USA till recent years. The sale cost is about $ 1.94/kg. The achievement of Israel in increasing its production almost eight times within a span of about 20 years has been primarily due to availability, with them, of the richest source of bromine i.e. Dead Sea brine and its concentrates and the process innovations brought about by their technologists. Recovery of bromine from sea water is mainly done in U.K., Franc U.S.S.R., Japan and Italy.

In case of steaming out process some modifications in th stripping tower have been reported which resulted in bett stripping of bromine from its source, reduced steam consump tion and lower packed heights. Use of separation processe like ion exchange, solvent extraction and gas separation mem branes in recent years have been reported. In Israel conven tional steaming out process is used alongwith cold absorptio process for bromine recovery.

They have reported pioneering work in use of solven extraction for increasing bromine content in the form of mag nesium bromide from end liquors obtained after recovery o salt, potassium chloride from Dead Sea brines and for recov ery or production of important bromo-compounds like cal cium bromide and tetra-bromo-ethane (TBE) instead o elemental bromine. Calcium bromide is extensively used i drilling fluids and TBE in mineral processing. TBE, itsel is used as the solvent for extraction of liberated (oxidised bromine from concentrated brines. Reaction of this bromine rich solvent after separation from brine with acetylene yields TBE (2).

The flat as well as hollow fiber gas separation membranes have been experimented upon for recovery of bromine (3). The oxidised brine after acidification is pumped under pressure inside the fibers on whose outer side the soda ash or caustic soda solution is circulated to absorb bromine separated from the brine and passing out through pores in the membrane walls. This technique, if proved economically viable will revolutionise conventional air-blowing process in which the air blowing and absorption towers will be replaced by compact gas separation membrane modules.

Future Plan for bromine industry in India:

As indicated earlier there is a need to increase indigenous production of bromine in India. The economic plant capacity of a plant for air-blowing process based on sea water is a few tonnes per day and a single plant of that capacity will probably result in surplus production of bromine. As per a thumb rule a ton of salt yields bittern to produce about 1.5 kg. of bromine and with 10 million tonnes of salt produced in our country 15,000 tons of bromine can be produced. It is felt that country's requirement of bromine should be met from bittern based plants alone. This approach apart from attaining self-sufficiency in bromine may encourage attempts for simultaneous production of other marine chemicals from bittern based on suitable processes. This will help in establishment of marine chemicals complexes in India.

Looking to the high cost of energy in our country, it is desirable that the new plants are properly designed for i) max-

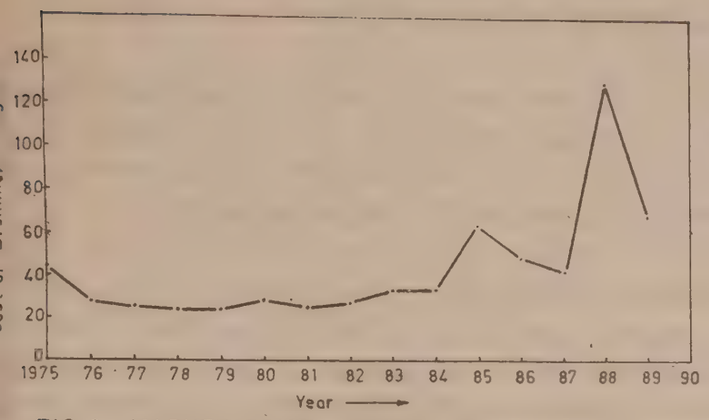

FIG.3. MARKET PRICE OF BROMINE

Fig. 3. Market price of bromine

num possible heat recovery from effluent, ii) processing of ittern with higher bromine content (which indirectly implies more stress on careful production and storage of bittern in salt works) and iii) minimum leakage of bittern, bromine etc from stripping towers.

Development of better materials of construction for fabrication of different equipments is essential. Probably all-glass plants offer a solution and some experience is already gained in this respect on imported plants installed a few years back.

Membrane separation is a new field and a number of institutions are already working in this field. Therefore, it is felt that work on gas separation membranes for bromine recovery and use of solvent extraction, particularly to increase the concentration of bromine in bittern needs to be undertaken in our country.

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Occupational health hazards in metallurgical and electroplating industries*

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Introduction:

Chemical Operations in engineering industries contribute to pollution of industrial environment, — some times more than in chemical Industries. The Operations of engineering industries which employ toxic chemicals or emit hazardous substances can be grouped as:

(i) Surface treatment operations such as: (a) Heat treatment; (b) Solvent degreasing; (c) Alkali degreasing; (d) Pickling; (e) Electroplating; (f) Anodising; (g) Phosphating; (h) Galvanising; (i) Metalising; and (j) Painting.

(ii) Foundry operations like (a) Melting and pouring; (b) Pattern shop; (c) Sand preparation; (d) Core and mould making; (e) Shakeout; (f) Finishing of casting e.g. fettling, grinding, shot blasting, etc.

(iii) Tool and cutter, grinding.

(iv) Use of cutting fluids.

(v) Welding and thermal cutting.

Use of asbestos, plastics and other newly developed materials also pose pollution problems which are specific to the substances in particular. An attempt is made to briefly touch upon each of them from the point of view of environmental pollution with a particular reference to the conditions, prevalent in this part of the country (Southern India).

Surface Treatment Operations:

(a) **Treatment:** Amongst the various heat treatment processes, carbonising and cyaniding have the potential of emitting environmental pollutants. Evolution of sodium cyanide and hydrocyanic acid fumes occur near the molten cyanide baths and the quenching tank respectively, in the latter process. The survey conducted in four heat treatment shops in South India did not reveal any build up of air borne cyanide and they are well within the threshold limit values of 5 and 10 mg/m³(as CN) near the bath and quench tank respectively.

A good general ventilation in heat treatment shop is usually an adequate control. However, a local exhaust with side extractors should be preferred for the molten cyanide bath, considering the risk from the highly toxic material. Cyanides can penetrate through the skin, hence cutaneous contacts should be completely avoided. Splashes of hot cyanide salts may prove still dangerous. Washing facilities and cyanide poisoning treatment kit should be kept ready. The need for meticulous personal hygiene should be stressed to the workers. Evolution of gases and smoke during quenching can be minimised by immersing the compounds immediately an fully into the quenching baths. However, the baths shou preferably be provided with canopy exhaust. Use of har gloves and face masks should be enforced.

(b) Solvent degreasing: Solvent degreasing — cold/h — is presently carried out with trichloriethylene. Chlorinate hydrocarbons, in general, are toxic to the central nervou system, liver and kidney. Trichloroethylene is comparativel less toxic among the whole range of solvents of this grou If the degreasing units are properly maintained the solver concentration near the workers is found within the threshol limit (100 ppm) as noticed from the levels found in som of the factories in South India. Safest way to equip the worke attending to cleaning or faults in the degreasing tank is t equip the person with a supplied air-line respirator. Prope type of hand gloves should be used for dipping the compo nents for degreasing.

(c) Alkali degreasing: Sometimes a miniature of causti alkali and soap solution is sprayed on the components in orde to remove the greasy contaminants from the surface. Som mist is invariably found to escape the degreasing units an form aerosols. Exposure to such aerosols leads to severe irri tation of the respiratory tract.

During one recent study in an alkali degreasing unit i Madras the average concentration of alkali aerosol was foun to be 1.11 mg/m³ (maximum 1.67 mg/m³) which is o course within the threshold limit value of 2 mg/m³ (c). A very good general ventilation should be maintained at such places as the concentration should not exceed this limit i any period of time.

d) Pickling: Hydrochloric acid is generally used in pick ing and it is highly corrosive and requires better control mea sures, because of its higher vapour pressure. Formation o acid vapour and mist is more when rate of pickling is high and more hydrogen gas is being evolved. Hence the factors like acid concentration, temperature and agitation influence the environmental contamination around the pickling vats. Concentrations of hydrogen chloride vapour near the pickling tanks in some factories are given in Table 1. It is evident that, if proper attention is paid, the concentrations can be kept within the allowable limits. Side extractors along the long side of the tanks maintained at adequate capture veloc ity is the best method of vapour and mist control. Wherever the pickling rate is low, use of inhibitors with a good general ventilation may also prove to be adequate.

* Paper presented at Seminar on Pollution and its Control in Metallurgical & Metal Finishing Inds. at AICMA Tech. Centre, Madras on Aug. 11-12, '89.

Table 1

Concentration of hydrogen chloride vapour/mist near pickling tanks in some of the factories in South India

Plant	Conditions	Concentration of HCl (ppm)
A	Tanks were locally exhausted by side extractors at both the sides	0.9
B	(i) No local exhaust was provided but fresh air was being mechanically forced into the room.	1.3
	(ii) When forced air ventilation was not working	4.3
C	No mechanical ventilation was provided, rate of pickling was moderate.	5.0
D	30' x 3 1/2' tank with 30% HCl — No mechanical ventilation rate of pickling high.	9.2 (max. 29.5)
	Threshold limit value	5.00(C)*

* Notation (C) indicates that the concentration should not exceed this value for any period of time.

Electroplating: Environmental hazards during electroplating varies with the type of plating baths. Typically nickel acid, copper, zinc and tin baths are hazardless; throw no spray unless air agitation is done, when good ventilation is required. Alkaline tin bath evolves little spray in use except when oxidation is done by H_2O_2 addition. In chrome bath, strongly irritant mist is evolved and requires strict control. In handling cyanide baths, HCN vapour is normally not formed; but the mist may contain cyanide due to gassing during plating.

Systemic disorders among the plating operators are relatively infrequent but injury to skin and mucous membranes from chemicals is very common.

Chromic acid on cutaneous exposure leads to ''chrome-holes''. Inhalation of chromic acid mist may lead to painless ulceration of mucous membrane followed by perforation of nasal septum. Concentration of chromic acid mist near some of the plating baths in South India are given in Table 2.

Evaluation of chromic acid mist can be controlled to some extent by covering the surface by plastic balls or by the additions of mist suppressants either to reduce the surface tension or to form layer on the surface. Complete control of the problem can, however, be achieved only by providing effective local exhaust at the sides of the tank.

Cyanide baths do not pose frequent hazards if proper precautions are taken. Deadly poisonous hydrogen cyanide gas is likely to form if the contents of the bath are brought in contact with the acid. Many times, it is seen that a common cold-swill tank is used for the components being plated in alkaline cyanide baths as well as for the components plated in acidic bath. Such conditions provide chance for formation of hydrogen cyanide gas.

Separate swill tanks should be used for alkaline and acidic bath. Meticulour care should be taken to prevent mixing of alkaline and acidic wastes both within the shop and in the treatment plant.

Concentrations of other metals being plated like copper, zinc, etc. also do not exceed the recommended upper limits. More care should, however, be taken while plating cadmium as the cadmium salts are much more toxic than other common metal salts.

Proper types of hand gloves should be used to avoid contact of skin with chromium, nickel and cyanide solutions.

(f) Anodising: In anodising the aluminium components with dilute chromic acid and sulfuric acid, sulfuric acid mist sometimes exceeds the threshold limit value. Precautions should be observed to suppress the contaminants by providing local exhaust arrangements.

(g) Phosphating: Apart from the hazard posed by highly corrosive acid and alkali baths while phosphating, high temperature of acid as well as alkali bath may cause scalds. Concentrations of phosphoric acid mist are in the range of 1.50 - 2.30 mg/m^3 and alkali mist carries 0.01 mg/m^3 of NaOH in a typical phosphating operation. Threshold limit values are: 1.00 and 2.00 mg/m^3 respectively.

Concentration of phosphoric acid mist goes above threshold limit during some steps. Local exhaust arrangements should be provided for the tanks which give rise to the contaminants.

(h) Galvanising: Zinc fumes if inhaled fresh may cause a condition commonly known as 'metal fume fever' among

Table 2

Concentration of chromic acid mist near chrome plating baths in some factories in South India

Plant	Conditions	Concentration (mg/m^3) as Cr.
A	No exhaust arrangement was provided	0.08
B	No exhaust was provided but surface was covered with plastic balls	0.05
C	Effective exhaust was provided at both the sides of the tanks	0.02
D	Local exhaust provided at both the sides of tank and surface covered by plastic balls. Load of work moderate	0.002
E	Local exhaust provided but not properly maintained. Plastic ball covered only part of surface. Rate of work was heavy	0.07
	Threshold limit value	0.05

the exposed workers. It is an acute fever with shivering. However, in general, the galvanising tanks both in continuous process and in batch dipping process, do not lead to objectionable zinc concentrations in the work room. A recent study indicated that the zinc oxide concentrations ranged from 0.05 to 0.30 mg/m^3 which is much below the recommended upper limits for zinc oxide fumes.

(i) Metallising: Hazard is posed in this process, by contact with hot particles. Inhalations of metallic fumes may also lead to various disorders depending upon the type of the metal being used.

Levels of fumes and dusts in some metallising operations show that in steel spray, Fe and Mn is well below the TLV of 5 mg/m^3; in bronze spray, the Cu concentration just meets the requirements (TLV being 0.1 mg/m^3); but in zinc spray, Zn content is nearly 2.5 to 10.0 times the TLV of 5.0 mg/m^3In the last case powerful local exhaust arrangement with electrostatic fume collector should be provided to prevent the health hazard and nuisance.

(j) Spray painting: Is the most commonly used method of painting, except for a few, very odd jobs, like ship building. The materials involved in spray painting are many, some of which may cause health/fire hazard or both.

Solvent vapours present a persistent hazard, severity of which depends upon the toxicity of the solvent. Dizziness, headache, nausea, eye and nose irritation are caused with moderate levels of solvent vapour.

If the levels are more severe, gasping with unconsciousness and vomiting may occur. Bronchitis results on prolonged exposure to solvent vapours. Occurence of dermatitis among the painters is very common but it most commonly originates in the misuse of solvents to clean the paint, off the skin.

Paint ingredients may cause systematic poisoning, if not handled properly. Hand dipping of lacquer based on tetrachlroethane caused an outbreak of lever disorders in India. Benzene has mostly been replaced by xylene and other less toxic solvents. Lead paints, if still in use, may pose serious problem of lead poisoning. Properly designed paint booth, eliminates most of the problems. There arise many circumstances, where provision of spray booths become impossible. Proper types of respirators should be used by the workers, while spraying paint without any exhaust.

Spraying the paint in confined spaces may lead to suffocation to workers. Under such conditions, supplied air line type respirator and safety belts should be used by the workers and their movements should also be watched by another worker at all times. He should also be equipped for rescuation work, under suffocating conditions.

FOUNDRY OPERATIONS:

Foundry operations in general are considered to be associated with dust and heat. Environmental problems of foundry are pointed out department wise in the following subheadings.

Melting and Pouring: The main problems encountered in melting and pouring departments of a ferrous foundry are: exposure to carbon monoxide from cupola; iron fumes and dusts, from all the furnaces; thermal decomposition products of the resins and binders used in cores and moulds (e.g. ammonia gas and formaldehyde vapour), excessive thermal stress; and exposure to infrared and ultraviolet radiations.

Carbon monoxide gas given off from the cupolas, furnaces, laddle preheaters, salamanders and poured moulds should

be taken care of while working in confined spaces around the furnaces. Places should be well ventilated before entry by any person. Electric furnaces may give rise to large amounts of metallic fumes depending upon the compositions of the metal/alloy. Roof ventilations above the furnaces is a common practice but local exhaust is more effective. Laddle repairing produces some silica dust, the inhalation of which should be avoided by use of proper dust respirators and other control measures.

Slag wool is formed when slag hits the air. This does not cause much or repiratory problems but irritates eyes, ears and nose. Slag wool should be allowed to fall on a container. Ammonia gas and formaldehyde vapour is released along with smoke and other breakdown compounds from the poured moulds and cores.

Pouring area should be locally exhausted by side extractors. Cooling canopy or tunnel should be provided with gravity or exhaust ventilators wherever practicable.

Pattern Shop: Woodworking machineries in pattern shop give rise to wood dust. Nasal cancer (equamous metaplasis) has, however, been caused in some wood workers. Epoxy resins which are used in pattern shop for glueing are sensitisers, repeated exposure to which may lead to allergic reactions like asthma or severe dermatitis. Local exhaust arrangements and proper hand protections should be provided wherever epoxy resins are used.

Sand Handling: Sands used in foundries contain high levels of free silica, exposure to dust of which leads to a disabling lung disease —'silicosis'. The outstanding points of dust dispersion, requiring enclosures and exhaust ventilators are: the shakeout hopper, transfer to return conveyor, transfer to elevator, transfer to and from other belt conveyors, sand screens, tailing pipes, sand mixers and receiving ports of the sand bins.

A recent study carried out in some foundries revealed very high dust at various steps in sand preparation plants as compared to the threshold limit values recommended.

Mould and Core making: Mould and core making operation do not create much dust by themselves as the sands are handled under wet conditions. However, the sand scattered around dry over a period of time and gets dispersed into air under the influence of air blown for dusting the prepared moulds.

Frequent sweeping of the floor may eliminate this problem. Concentration of dust in South Indian foundries ranged from 6 to 35 mg/m^3 which is much higher than the upper limits. Other hazards while core and mould making are exposure to silica flour.

Shake out: Shake out is the most dusty operation in a foundry. Concentrations as high as 53 mg/m^3 (TLV 0.18 mg/m^3) were found in a study. Some authors have suggested moisturing of moulds prior to shake out, along with moisturing agents to improve the penetration of moisture into the sand. Enclosures and local exhausts of various type to suit the different types and sizes of castings have been devised successfully.

Finishing Operations: Fused silica, sticking on the surface of the castings is released while finishing the castings by fettling or grinding/cleaning prior to finishing, by sand/-shot blasting or by tumbling. The last process reduces the silica content of the dust.

Sand blasting has been generally replaced by enclosed shot blasting. Objectionable dust levels are seen even around the shot blasting machines. But if the exhaust systems are maintained properly and dust dispersion from other dusty operations is not permitted near these machines, it could be operated without much dust. Fettling and grinding of castings leads to objectionable dust as high as 45 mg/m^3. Local exhaust arrangements and their proper maintenance are essential for these operations.

Tool and cutter grinding: Dust produced during tool and cutter grinding contains steel particles along with dust particles of aluminium oxide/silicon carbide depending upon materials of grinding wheel. Aluminium oxide and silicon carbide are not toxic dusts yet inhalation of very dense clouds of these dust may interfere with the normal functioning of lungs.

Studies conducted in various tool and cutter grinding operations indicate that objectionable dust formation does not occur while grinding the jobs. However, dressing of grinding wheels produces more dust in almost all type of grinding machines and it comes within 30 mppcf which is the upper limit (though the dust level goes as high as 465 mppcf in some machines while dressing). In the machines where the dust generation is tremendously high while dressing as in the case of "pelma grinders" and "three phase grinders" local exhaust should be provided. Proper design of the slots is very important in these machines for effectiveness of exhaust systems.

Use of cutting fluids: Cutting oils, also know as lubricoolants, used in order to prevent the heat damage of the components, while machining, come in contact with the hands and arms of the operators, tool setters and swarf removers. Sometimes when the concentration of oil mist becomes high, it poses hazards of the respiratory type. 'Oil acne' was previously considered to be the only problem due to cutting oils,

but with the introduction of water based fluids, "eczematous contact dermatitis" has become the more common skin disease. Other skin lesions like chlor-acne, keratosses, squamous cell cancer and melanosis can also be caused by cutting oil exposure.

Water based coolants, from which even pathogenic bacteria have been isolated, cause no oil acne. Eczematous contact dermatitis is generally attributed to soap like effect and alkalinity of the water base cutting oils.

Sometimes the cause of lesions may be due to the sensitisations by bacteriocides which are added to the coolants. Low boiling point distillates like kerosene and light machine oil may also cause sensitisation. Common practice is to add too much of the disinfectant again and again. This makes the oils more harmful.

Welding and Thermal Cutting: Welding and thermal cutting operations give rise in fumes which generally contain oxides of iron and other ingredients of the steel. Iron oxide fumes are not toxic, however, they produce opacity in the lung x-ray which is sometimes misleading. Sometimes ozone gas is formed while arc welding but concentrations are generally found within the prescribed limits.

Fumes produced from the thermal cutting and gauging operations are generally more than those from the welding. Threshold limit recommended for the welding fumes (total) is 5 mg/m^3. Generally, this value is not exceeded within the face shield if it is not a confined place. If the steel sheets being welded are coated with some other materials, possibilities of the presence of those contaminants in the fumes should be considered.

Studies of fumes while welding the zinc and iron oxide primer coated steel sheets did not show objectionable zinc fumes. Care should, however, be taken while welding with cadmium, nickel and chromium plated metals. Welding on galvanised steel has caused metal fume fever among some workers.

Conclusions:

Review of environmental pollution problems with reference to conditions prevailing in South Indian engineering industries, suggests that there are numerous operations in engineering industries which have the potential for polluting workers' environments.

In some of these operations, conditions in South Indian Industries are not objectionable but in many others there exists scope for much improvement.

NEWS FROM ABROAD

NIMONT POISED TO BUY NIA FIBRE ASSETS

Italian chemicals major, Enimont. is likely to acquire the operations of Snia Fibre, the fibres division of space, defence and chemicals group, Snia. Rumours developed on the Italian stock exchange after sharp rises in the shares of both companies Enimont would make the acquisition through its fibres arm, Montefibre, formerly part of Montedison and now incorpporated in the Enimont joint venture between Enichem and Montedison.

Earlier rumours of an asset swap between the two companies involved the group's fibres operations and Snia's fine chemical and engineering compounds divisions. A recent newspaper interviews, Enimont chairman Lorenzo Necci confirmed that by the end of 1989, Enimont and Snio are expected to reach an asset swap agreement. The move reflects the chairman's aim to streamline Enimont's portfolio so that it remains only in markets where it has leadership in cost, technology or sales.

However, market observers insist the deal will go beyond such a swap, since Enimont holds a leading position in the world acrylics market. As Snia would be unable to withstand such fierce competition on the fibre front, it would be forced to cede its acrylic assets to Enimont, they say.

As the same holds true for polyester fibres, it may also cede these operations to Enimont leaving it practically with only polyamide fibres assets. It holds about 50 per cent of Italy's nylon market, and 13 per cent of the European market. The natural conclusion would be for Snia to cede these also to Enimont, say sources.

Market rumouuss have put a price of at least L500bn ($357m) on Snia Fibre, and claim that Montefibre would be able to raise necessary funds on the market through a capital increase. Snia Fibre ended 1988 with L854bn sales and L27bn net profits.

The combination of both companies' fibres assets would be a feosible move, said European chemicals analyst, Penny Tattersall, at Barclays de Zoete Wedd. The Italian textiles industry needs shaking up quite radically, and although it would be a move into a fairly difficult area of business, and it may be some time before a return is seen, it would be beneficial in the longer term.

Meanwhile, the public offering of 20 per cent of Enimont's shares is to take place near mid-September. Market observers are indicating a price of around L1,250-1,550/share. Tattersall believes a price of around L1,500 is likely, making it look reasonably cheap in comparison with other European chemical companies. It would have to be priced at a discount given that it could be considered a risky investment in a new company, which is a commodity-based business, she explained. However, there should be substantial interest in it, she predicts, especially within Italy.

AJINOMOTO STALKS GECHEM UNIT

Belgium's Gechem, the chemicals unit of Societe Generale de Belgique, is conducting negotiations for the sale of its fine chemicals subsidiary, Omnichem, to Ajinomoto Co Inc of Japan. The sale will represent the last major step in Gechem's restructuring to streamline its chemicals business, said a company spokesman.

Precise details on the proposed transaction will only be available on completion in around mid-September, says Gechem. However, the purchase price for Omnichem will be BF3.78bn ($92.4m), disregarding costs connected with the deal. Omnichem reported a turnover of BF1.6bn with profits of BF120m in the year ended 31st December 1988.

Omnichem's fine chemicals activities are focused on the production of intermediates for the food and pharmaceutical industry, and of phytopharmaceutical formulations. Ajinomoto, with a turnover of Yen510bn/year ($3.6bn), has diverse activities in the manufacture and distribution of quality food products, amino acids and fine chemicals.

The proposed deal reflects Ajinomoto's strategy to broaden its fine chemicals business segment and establish a base for expansion into Europe.

Gechem now plans to concentrate business in its two core areas, through Recticel, its polyurethane foams subsidiary, and Sadacen, its metallic oxides and salts division.

HIMONT ACQUIRES

Montedison's US polypropylene subsidiary, Himont, has announced the acquisition of Plasma Science Inc, a medium-sized California-based company, specializing in technology for the surface treatment of plastics.

According to Montedison, Plasma Science's gas plasma technology is effective and environmentally safe and is used to prepare plastics to receive dyes, paints or other coatings. In addition, it enables the use of less expensive materials, such as polypropylene, to achieve a final product with high-quality performance and form.

FUJISAWA BIDS FOR LYPHOMED

The current series of mergers and takeovers in the pharmaceutical industry may be continued with the recent takeover bid by Fujisawa Pharmaceutical for US drug producer LyphoMed. The $31/share offers values of LyphoMed at around $1bn.

The bid represents the first serious move by a Japanese pharmaceutical company to enter the huge US market. However, Fujisawa already has connections with the US through a joint venture with SmithKline, a licensing agreement with American Cyanamid and an existing 30 per cent interest in LyphoMed.

LyphoMed reported a net loss of $21.1m on revenues of $127.8 m in 1988. But interest in the company was revived when the food and drug administration (FDA) approved LyphoMed's NebuFent aerosol which is used for the treatment of pneumonia in AIDS patients. Although it has not yet received approval from the board, the bid sparked off trading in LyphoMed shares.

Meanwhile, the president of US drugs company Rorer, Robert Cawthorn has spoken out to quash increasing speculation that the company may be subject to a takeover bid. The company wants to acquire, not be acquired, said Cawthorn.

However, Rorer is on the lookout for suitable links with other companies to boost its marketing and R&D. It already has marketing agreements with Upjohn Co. and Bolar Pharmaceutical, but Cawthorn says its would only consider a merger if it retained the upper hand.

Rorer seems well aware of the vast amounts of money needed for R&D if a company is to compete effectively in this market. Its 1989 budget of around $125m could be doubled in a few years, according to Cawthorn. R&D agreements involving cooperation with another company to develop a product then share the marketing rights, could be a possibility in the future, he said.

AIR LIQUID UPS ITALIAN INTEREST

France's Air Liquide SA is to make a bid for the remaining 49 per cent of the Italian gases company, Societa per l'Industria dell' Ossigeno & di Altri Gas SpA (Siossigeno) through its Italian subsidiary, Parital SpA.

It already holds a 51 per cent stake in the company, which produces liquid oxygen and other gases for industrial and therapeutic uses, as well as equipment.

In 1988, Siossigeno recorde a net profit of L27.7bn ($19.3m on sales of L313.7bn. A 20.5 pe cent interest in the company currently held by the Falciola fa mily, while the remainder is hel by minority holders.

OIL CRISIS LOOMING LARGE IN CHINA

China's oil industry was in dol drums having suffered a loss o over a billion renminbi ($320 last year.

China's exports fell to 32 mil lion tonnes last year, with foreign exchange earnings also dropping to $3.62 billion.

This was disclosed in Singa pore by Mr. Chen Haoran, Executive Vice President of the Sinochem (China National Chemicals Exports Corporation), a Government organisation, while addressing the three-day Asia Pacific Petroleum Conference (APPC) which concluded in Singapore recently.

Mr. Chen said to cope with the rising demand fir oil, particularly in the coastal areas, China has started to import oil again — about two million tonnes a year.

He said though China ranked fifth currently among all oil producing countries, the crude oil share per capita is only 121.82 kg with its population reaching a figure 1.1 billion.

In recent years China's crude oil production registered an increase of two to three per cent only, while the demand went up by at least six per cent annually he added.

He spoke of the possibility of China's oil export going down further while import may increase in the next few years as no major oil field like Daqing in devel-

oped and the world oil price remains at a lower level.

China's oil exports had declined steadily in the last three years along with oil-generated foreign exchange.

Its exports was 34.22 million tonnes of oil amounting to $3.07 billion in 1986 and the figure fell to 33.62 million tonnes valued at $4.12 billion in 1987.

Last year China exported only 32.07 million tonnes earning $3.62 billion.

Besides, increase in the annual demand for oil, Mr. Chen said crude oil and products in China were far less developed than expected. Therefore, in many areas oil supply is very short as other sources of like coal and electricity, he added.

Mr. Chen appealed to both OPEC and independent oil consuming countries to make concerted efforts in co-operation for keeping the world oil price reasonable and stable, which is good for the interest of all countries.'

"We fully appreciate the agreements OPEC has reached so far in keeping their production quotas and coordinating with the independent oil producing countries in stabilising the world oil markets", he said.

China, he said, sincerely hoped that the oil price war would not happen again because it was detrimental not only to prooucers but also to consumers and to the healthy development of world economy as a whole.

PETROLEUM PRODUCTS FROM NATURAL GAS

Construction has begun in Malaysia on the world's first commercial plant that will convert natural gas to a variety of petroleum products.

If successful, the technology used in the plant could have a substantial impact on the international oil market.

The $700 million plant, being built in Bintulu in the Malaysian state of Sarawak, will be run by Shell MDS (Malaysia) Sdn. Bhd., a joint venture between the Japanese trading company Mitsubishi Corp., Shell Gas B. V. of the Netherlants, Petronas, the Malaysian national oil company, and the state of Sarawak . Production is scheduled to begin in 1993.

The plant will convert natural gas to kerosene, diesel fuel, naphtha and wax. Initially all the products will be used in Malaysia except for wax, which will be exported to Japan. Officials hope to eventually export other products as well.

The project became commercially feasible because of Shell's development of an efficient catalyst for converting synthetic gas, produced from natural gas, into other petroleum products, said a spokesman for Mitsubishi.

Flexible product pattern

Although crude oil is less expensive than natural gas, the low cost of converting natural gas to other petroleum products will make them efficient on the world market, the spokesman said. The plant will also have a high degree of flexibility that will allow the ratio of the various petroleum products produced to be easily adjusted to meet changing demand, the spokesman said.

At present, natural gas is marketed as liquid natural gas (LNG), which requires large investments on the part of producers and consumers in plants to liquefy the gas, long-distance pipelines, special refrigerated-tanker ships and huge storage tanks. As a result, only large users such as power companies have been able to purchase sizable quantities of LNG on a long-term basis. Malaysia's only foreign customers for LNG are two Japanese firms that have promised to buy a total of 7 trillion cubic feet over 20 years, a little less than half the gas field's total estimated reserves.

Converting natural gas to standard petroleum products eliminates the need for such expensive specialised storage and transportation systems, opening up a larger market.

If the technology is successful, the Soviet Union, Australia and countries in West Asia and Africa that have large natural gas reserves may be interested in building similar plants. By creating competition for crude oil producers, the Shell technology could have a substantial impact on the world oil market, said Mr. Masayoshi Sakuma, spokesman for JGC Corp., a Japanese engineering firm that is the main contractor for the plant's construction.

The plant will produce about five lakh tonnes of petroleum products a year. Shell Gas owns 60 per cent of the venture, Mitsubishi 20 per cent, Petronas 10 per cent and the state of Sarawak 10 per cent.

Chemical Markets Abroad

SLACK DEMAND PUSHES ACRYLO Q3 CONTRACTS DOWN

Acrylonitrile contracts for the third quarter have slipped, reflecting the weakness in primary end use sector, acrylic fibres. Most players accept the lead shown by DSM in fixing contracts at DM1,540-1,600/ton FD down from the second quarter's DM1,670-1,770/ton FD. Nevertheless, acrylo producers expect this quarter to be more profitable as the contract price for key feedstock propylene, is much lower this quarter at DM825/ton.

Most producers agreed that the outlook does, however, appear gloomy particularly in Europe. Most European acrylic fibres producers are cutting back on material and there is still, excess material in the market.

Some buyers may try to hold out for lower feedstock costs onto customers.

In the second quarter propylene contract prices were settled at DM1,060/ton, which represented a hike of some DM150/ton. Not surprisingly, producers were keen to pass on the increased feedstock price to customers but failed to do so. Producers appear to be passing about DM100/ton on the third quarter contract saving but the remainder is being held by producers to make up for the last quarter when they were losing money.

The acrylic fibres market is still very weak in Europe, with talk of further rationalization on the horizon — Enimont's interest in Snia's acrylic fibres business. Growth is said to be much higher in the Far East but the People's Republic of China's diminished [illegible] n the market is having a major effect on acrylonitrile fortunes. Last year China consumed some 300,000 ton of acrylonitrile, so far this year the People's Republic has bought only 50,000 ton of material. It is likely that China will have to move heavily into the market in the next three months as most estimates peg the country's minimum acrylonitrile requirement to be some 100,000 ton/year.

In addition, there appears to be plenty of T1 material from the US available at $700/ton fob, although numbers lower than this have been heard. The $700/ton price gives an equalized T2 number of DM1,533/ton which is not far off the contract price being paid by longstanding acrylic fibre producers.

Spot prices in the Far East are still faltering, standing at some $800-810/ton cif Far East. Six months ago the spot prices stood at around $860-870/ton cif Far East.

With little chance of any significant upturn in the fibres market, if anything it could get worse over the next six months, according to one acrylonitrile producer, the acrylonitrile manufacturers are looking to cut their dependancy on the Chinese market and seek out the faster growing end uses such as ABS and MMA production

UNION CARBIDE TO BUY DOW ETHYLENE

Dow Chemical Canada has landed a long term deal to supply Union Carbide Chemicals & Plastics with 200,000 ton/year of ethylene. The olefin will come from Dow's new 500,000 ton/year Fort Saskatchewan, Alberta-based cracker, which is due on-stream late 1993.

Union Carbide will use the ethylene as a feedstock for its planned ethylene oxide/ethylene glycol expansion at Prentiss, Alberta. Union Carbide operates a 300,000 ton/year unit there and is adding a further 300,000 ton/year, costing some $300m.

This feedstock deal may cause Nova some anxiety as Union Carbide was a potential customer for ethylene from its planned Can$ 700m ($598m) expansion at Joffra. Nova has plans for a Can$500 m 659,000 ton/year cracker and a Can$200m linear low density polyethylene expansion. Both units are expected to be on-stream in 1992, but this start-up date may now need to be revised.

BASF COMMISSIONS BELGIAN MDI UNIT

BASF has brought on-stream its 60,000 ton/year methylene diphenylene isocyanate (MDI) plant at Belgian subsidiary, BASF Antwerpen. This new unit doubles the company's MDI capacity at Antwerp, while it continues to raise output elsewhere in the world.

The West German major is expanding MDI capacities in the Far East, through two joint ventures, and in the US. In South Korea with Hangyang Chemical, BASF is building a 40,000 ton year unit at Yoechun, while in Japan, its joint venture with Takeda Chemical Industries is building a 30,000 ton/year MDI distillation unit at Kashima.

BASF is raising MDI capacity at Geismar, Louisiana to 100,000 ton/year. Toluene diisocyanate capacity at the site is being hiked from 75,000 ton/year to 100,000 ton/year.

Biotechnology

BASF SUBMITS NEW PLAN FOR TNF PRODUCTION UNIT

BASF has submitted a new application to build a test plant for its genetically engineered anti-cancer drug tumour necrosis factor (TNF) at Ludwigshafen. The group's original plans, submitted in September 1988, met with considerable local opposition.

Under federal emission control statutes, in effect since September 1988, plants using recombinant DNA technologies are subject to a public hearing. Opponents also have the right to file written objections to the plans. Nearly 650 objections to BASF's project were received by the municipal authorities.

Although city officials were apparently satisfied with the information provided in the 15 page application, opponents claimed that details on product and safety precautions were "too fragmentary". During the public hearing in late April, the chemical group narrowed the scope of its application, limiting the project to TNF production with a laboratory culture of Eschericia coli K12. This forced a new hearing.

BASF now says it believes the new application will have a better chance of being approved — possibly within six to eight months — than a revised draft. The scope of the document has been widened to 140 pages and encompasses detailed information on safety.

Among other precautions to be taken to prevent escape of the bacteria, a vat is to be installed beneath the fermenter to sterilize waste water. According to the company, its planned safety measures exceed those of the federal emissions control regulations.

The Greens in the state of Rheinland-Pfalz, of which Ludwigshafen is a part, have called on city officials to consult outside experts to study BASF's new application. Parallel to the Ludwigshafen project, BASF is planning a TNF test facility in Boston, US, scheduled to be started in 1991.

Meanwhile, the state of Hesse has said it will ask the Bundesrat to reinstate provisions for a public hearing for all genetic engineering projects in the new framework law passed recently by the cabinet. Part of the federal environment ministry's original draft, the requirement was dropped for all but high risk projects in the cabinet's version.

In other news, the West German federal biological authority (BBA) has received research ministry funds totalling DM625,000 ($322,500) to study the safety of using genetically altered baculoviruses in pesticides until 1992.

SANOFI EXPANDS BIOTECH INTERESTS

Elf Aquitaine subsidiary, Sanofi has made moves to gain a foothold in the rapidly growing aquaculture market, plus a position in the algal products market. The company has bought a 70 per cent stake in French Aquaculture and has established a joint venture in the Philippines to produce food quality algal products.

By acquiring the French Aquaculture stake, Sanofi hopes to develop advanced aquaculture technologies. French Aquaculture boasts a turnover of FF54m/year ($8.2m). With its experience in biotechnology, the Elf subsidiary is confident the new venture will make a significant contribution in the growing international markets.

Through its affiliate Sanofi Bio-Industries, Sanofi has established a joint venture in the Philippines to produce algal extracts to be used by the food industry. Sanofi has teamed up with Marcel Trading Corp.

The joint venture, Philippine Bio-Industries will build a plant in Canlubang to produce some 400 ton/year of Carrageenan using 2,000 ton of algae grown at local farms.

CHEMEX SIGNS DEAL

US firm Chemex Pharmaceuticals has signed a drug evaluation and licensing agreement with Senju Pharmaceutical Co of Osaka, Japan, for the dermaceutical Co. of Osaka, Japan, for the dermatological application of CHX 3107.

Under the agreement, Denver, Colorado-based Chemex will evaluate CHX 3107, also known as EPC-K1, as a new approach for the control of the inflamation, and possibly photoageing of skin. Senju is understood to have developed a large quantity of data on the compound's properties, enabling development and commercialization of the drug.

The licence gives Chemex exclusive worldwide rights with the exception of certain predesignated countries.

In a separate development, the company has reacquired, from Solvay Veterinary Inc., the development and marketing rights to Chemex's proprietary and prescription drugs targeted at skin diseases and disorders.

To date, Chemex has signed research and licensing agreements with Upjohn, Takeda Chemical, Trans CanaDerm and Yale University's Department of Dermatology.

Technological Scene Abroad

GRACE OPENS FCC CATALYST UNIT

The European Davison operation of WR Grace and Co. has started up its $25m fluid catalytic cracking (FCC) catalyst expansion at its Worms, West Germany plant. This expansion marks the first step in a major capital expenditure programme for Davison's FCC operation in Europe, and brings the company's European FCC capacity to 45,000 ton/year.

The expansion will also permit the manufacture of a number of new products.

A new family of Ultra Stable Y zeolites, under the Z14G name, combining chemical treatment and hydrothermal dealumination, will be available shortly. These materials are specifically designed to boost motor octane barrels and can be incorporated into all Grace FCC catalysts manufactur in Europe.

The M series of catalysts already available offers variable matrix-cracking capabilities. The series allows further tailoring of catalyst to feedstock properties, and can offset the negative effects of feed metal such as nickel and vanadium.

lso available from the plant is Resoc, which succeeds said by the company to ost widely used FCC ca- pe. Super Resoc of- properties but with line yield at an r octane number.

TI APPEALS FINE

Farmaceutici pA, the Italian subsidiary of the Swiss parent, has asked the European Court of Justice to cancel the Ecu800,000 ($661,000) fine imposed by the European Commission for infringing EC competition rules.

The commission blamed Sandoz for leaving until November 1986 the note "Exportation forbidden" on the invoices corresponding to shipments to its customers, thus discouraging parallel exports to other EC states.

In a hearing before the summer recess, Sandoz pleaded not guilty, saying the note was maintained due to negligence by its services, which were reorganized when the Italian subsidiary was restructured. It was divided at that time into two separate companies: Sandoz Prodotti Farmaceutici and Sandoz Prodotti Chimici. The company claims the commission was unable to prove an agreement existed between Sandoz and its customers aimed at partitioning the market, and was also unable to present evidence of the negative effects the clause might have had on competition. Sandoz claims simple negligence. And has commented that it demonstrated its willingness to cooperate by deleting the clause as the commission suggested, from what the company regards as only an accounting element submitted to customers after the goods have been shipped.

The commission disagrees with Sandoz, saying the invoices are not exclusively accounting documents, as they include a series of clauses concerning legal competence.

As they appear on all Sandoz invoices they amount to a real "general contract" binding on all Sandoz customers.

In addition, the commission says it does not need to analyze any effects on exports as the clause is per se incompatible with Article 85.

As an alternative, Sandoz asks for a reduction in the fine as it never denied its mistake and corrected it immediately after the initial commission intervention.

The commission, however, wants to see the fine upheld as its says the infringement is very serious, especially as the company has an extensive internal organization, which includes a legal department, and can well afford the fine.

Meanwhile, Sandoz has been authorized to extend its French drugs production unit located near Orleans, on the Loire river. The FF180m ($27.6m) investment had been held up because of opposition from the local population which was wary of the plan which involves building a storage unit in the town

FERRO'S BISMALEIMIDE COMPOSITE

Ferro (Cleveland) believes its new bismaleimide (BMI) copolymer composite CPI-2275 will "fill a gap that had prevented the use of composite materials in many applications" because oo cost and heat-resistance considerations, says Raj K. Dhawan, general manager of the composites division. "What's more, previous BMI formulations often were too brittle or too difficult to handle in marufacturing." Suggested applications include those where heat resistance, impact tolerance, material workability, and low weight are important, for example in aircraft wing edges and jet engine components.

News About New Projects

FLUOR EARNINGS UP, IN UK MOVE

Fluor Corp more than doubled net earnings in the six months ended 30th April 1989 to $45.5m compared with $19.3m in the same period in 1988. Revenues for the first six months were up 40 per cent to $3.1bn compared with $2.2bn last year.

For the second quarter of fiscal 1989, net earnings were $23.9m, up 132 per cent compared with $10.3m in 1988. Revenues for the second quarter were $1.6bn, up 42 per cent compared with $1.1bn last year.

New engineering and construction awards in the second quarter were $1.7bn, up 27 per cent from a year ago. For the first six months of 1989, new awards totalled $3.3bn, 24 per cent ahead of last year's $2.7bn. Backlog grew 33 per cent to $7.3bn from $5.5bn last year.

David Tappan, chairman and chief executive officer, said: "Fluor Daniel, the company's principal engineering and construction unit, was the dominant earnings contributor and posted the largest year-to-year gain. Its earnings growth reflects both increased volume and improved margin.

"Market conditions for our engineering and construction services are robust in most of the industries served by Fluor Daniel. We are continuing our strategy of selectively targeting projects where we can add value to further enhance profit margins."

Recent awards include a $30m contract by Ciba-Geigy for an additives plant expansion at McIntosh, Alabama; two contracts by Rohm and Haas Co. — at an acrylic paint bases complex at Bristol, Pennsylvania and at a Philadelphia complex to upgrade sewar and tank systems to meet environmental requirements. Fluor Daniel has also been awarded a contract for phase I of a three-phase programme to reduce the level of nitrogen oxides (NOx) emissions at Unocal Corp's Wilmington, California refinery; and for an MTBE plant planned by Neste OY and Petro-Canada in Canada.

Under the terms of this $2.10m contract, Fluor will provide engineering, procurement and construction services for a 500,000 ton/year plant at Edmonton, Alberta. Engineering work has already begun and the plant is due on stream in late 1991.

Separately, Fluor Daniel's UK office is moving from its current central London headquarters to a newly-purchased office building near Camberley, Surrey. The move, to be completed by February 1990, comes as a result of growing business in the UK, the company says.

KELLOGG WINS MOSSMORRAN OLEFINS EXPANSION PROJECT

MW Kellogg has been awarded a contract to carry out design work on the £100-200m ($150-300m) Exxon-Shell Mossmorran ethylene expansion project in Scotland.

Won against competition from around half a dozen ethylene plant contractors, including CF Braun and Lummus Crest, the award involves studies which should lead to the main contract for detailed engineering, procurement and construction. However, before this is placed with Kellogg, Exxon, operator of the plant, needs to apply for planning approval, which the company intends to do in December. Board approval will be sought simultaneously.

The cracker will be expanded by 250,000 ton/year of ethylene from the current 650,000 ton/year. In addition, production of 180,000 ton/year of polymer-grade propylene will be introduced.

To secure the ethylene plant site in the long-term and to take advantage of the available raw materials, Exxon intends to introduce feedstock flexibility to enable the plant, currently an ethane cracker, to also process propane and butane.

The existing facilities, supplied by Lummus Crest, use seven Exxon-design furnaces. The two new cracking furnaces will also be Exxon's design. Kellogg's scope does not include furnaces or the cogeneration units. Contractors for this part of the project will be selected next year. Completion of the project will become one of the world's largest ethylene facilities, is planned for 1992.

While Exxon's half of the output will continue to be shipped to the company's plants on the European continent, Shell's will be used in the UK. The company's Shop higher olefins plant at Stanlow is running at 270,000 ton/year and the company could expand this to 400,000 ton/year. Another ethylene user will be Shell's new 100,000 ton/year low density polyethylene plant at Carrington, which will replace the existing PE facilities and add on to total capacity.

Shell has not yet decided where its 90,000 ton/year share of the propylene from Mossmorran will be consumed. The company currently uses in the region of 200,000 ton/year in polypropylene and 80,000 ton/year in solvents production.

Shell's new 120,000 ton/year pripylene splitter at Stanlow has recently come on line and is supplying product to the Carrington PP plant. This facility has a capacity of 120,000 ton/year but is being replaced by a new Lippshac-process 130-140,000 ton/year PP unit. The company's current sources of supply are the new splitter, Shell's other production units outside the UK and third party suppliers

CHI MEI IN MAJOR PS EXPANSION IN TAIWAN

Taiwan's Chi Mei, which next year becomes the world's second largest ABS producer (after General Electric Plastics' Borg-Warner) with 500,000 ton/year capacity, has announced plans which will make it Asia's largest producer of polystyrene.

A two-stage expansion will raise the company's capacity from 150,000 ton/year to 350,000 ton/year by the third quarter of 1990. Existing capacity is being debottlenecked to 200,000 ton/year by early 1990 and new capacity of 150,000 ton/year added by the third quarter. The complex is based at Taiwan.

In 1989, Taiwan's polystyrene/expanded polystyrene capacity was 460,000 ton/year. Other PS expansions planned in Taiwan include Huntsman, raising capacity from 23,000 ton/year to 40,000 ton/year next year, and Eternal and Kaofu, together adding 40,000 ton/year by the second half of this year.

Japan's Asahi Chemical is currently Asia's largest producer with 330,000 ton/year capacity. Other expansions planned in the region include Dow and Montedipe in Hong Kong and varicus additions in Japan. In Korea, Dongbu, Hyosung BASF, Chiel Industries and Lucky, all recently added capacity.

WORK STARTS ON OXYMAR VCM PROJECT

Occidental Chemical and Marubeni Corp have begun work on a previously announced $300m vinyl chloride monomer (VCM) plant at OxyChem's Ingleside, Texas, chloralkali complex.

Conceived during negotiations by the partners on a major project at Tenghiz in the Soviet Union, the US facility will have a capacity in excess of 450,000 ton/year. It will be owned by Oxymar, a joint venture between the two firms, and commence operations in the fourth quarter of 1990.

Bechtel has been appointed to carry out engineering and construction of the facility, which will use technology supplied by Stauffer (now part of EVC) and Mitsui Toatsu.

Under the terms of the joint venture agreement between Oxy and Marubeni, OxyChem will operate the plant on behalf of Oxymar and supply the chlorine and ethylene required. Chlorine is produced on site while ethylene will be delivered from nearby Corpus Christi.

Roger Hirl, president and chief operating officer of OxyChem, said worldwide demand for VCM, particularly in the developing countries of the Far East, will remain strong.

In addition, OxyChem has dedicated a new $40m, 360,000 ton/year ethylene dichloride plant at Ingleside. This facility is based on the BF Goodrich process and was also engineered by Bechtel.

DOW TO EXPAND STADE PO, REVAMPS CHLORINE PLANTS

Dow is to expand capacity of its Stade, West Germany propylene oxide (PO) production facility. The complex, its only European PO plant and one of the biggest single propylene oxide sites, is being expanded from the current 420,000 ton/year to 580,000 ton/year. The project forms part of the company's DM900m ($461.5 m) investment programme for 1988-1992 at Stade.

Also included in the plans is a major revamp of the chloralkali complex at Stade, currently all based on Dow's diaphragm technology. The new facility will incorporate Dow's first membrane chloralkali technology to be built outside the US. The process has been developed jointly with De Nora.

A major share of Dow's propylene oxide output is used captively but a large portion is also sold on the market. The need for increased capacity intensified with Dow's acquisition of BP's urethane business and the continued high growth rate of Dow's speciality urethane business, particularly in key industries such as automotive and appliances.

Introduction of Dow's P-series glycol ethers **(Dowanol P)**, as an alternative to the E-series also exceeded expectations, the company says. An increase in glycol ether capacity is planned for 1991, requiring increased propylene oxide feedstock.

The PO process technology, incorporating some recent improvements, will be based on Dow's chlorohydrin process. Completion of the project is planned in 1991.

With around 1.3m ton/year global PO capacity each, Dow and Arco rank as the world's largest producers of the urethane feedstock, although Arco recently said it is the leading worldwide supplier.

Dow's other propylene oxide facilities are located in the US, Canada and Brazil. At Freeport, Texas, it is raising capacity from 635,000 to 726,000 ton/year.

Arco has just announced, it is adding 50,000 ton/year of PO capacity at its Fos sur Mer plant in France to bring the total there to 200,000 ton/year.

EXXON TO BUILD ROTTERDAM PHTHALIC ANHYDRIDE PLANT

Exxon Chemical has confirmed plans to build a grass roots phthalic anhydride plant at its Rotterdam, the Netherlands site. The facility will have an initial capacity of 50,000 ton/year and is due on stream in mid-1991. Foster Wheeler Italiana has been awarded the engineering contract.

In addition, Exxon is about to make an announcement on a new higher olefins project.

Phthalic anhydride is a key raw material used by Exxon to make its **Jayflex** plasticizers, made at the company's recently expanded 250,000 ton/year plant, also at Rotterdam, for which 80,000 ton/year of phthalic anhydride is needed. The company's planning permission is for a unit of 99,000 ton/year, so an expansion at a future date is possible.

Exxon already makes the other raw materials required to produce plasticizers, namely, orthoxylene, higher olefins and oxo-alcohols.

"Our phthalic anhydride plant will provide the final integration link in the production chain from crude oil to plasticizers," said Peter Peschak, vinyl intermediates director at Exxon Chemical International.

The company currently obtains most of its phthalic anhydride through toll conversion of its own orthoxylene. "However, our needs have nearly tripled since our plasticizer plant came on stream in 1978," Peschak said. "This growing demand for heavier molecular weight plasticizers now requires that we build our own phthalic anhydride plant," he added. The new facility will incorporate Exxon's technology, have a low emission rate and significantly reduce road and barge movements to and from Exxon Chemical's Rotterdam facilities.

Exxon last year expanded its alcohols capacity and product range by acquiring the Noroxo plant in northern France.

NEWS FROM JAPAN

JOINT VENTURE FOR TONER RESIN ESTABLISHED IN U.S.

Sekisui America Corp. — U.S. subsidiary of Sekisui Chemical Co. — and Union Carbide Chemicals and Plastics Co. (UCCP) have jointly established a 50/50 company — Hematec Polymers Co. — in Danbury, Connecticut, the United States.

The joint firm will supply customized styrene-acrylic resins for toners used in copying machines and laser printers. Total U.S. sales of resin-based toners are $2 billion annually.

"This joint venture will help us supply the toner market with the resins needed for the latest technology in printers and duplicators," says UCCP President F.J. Costello. For Sekisui Chemical, it will facilitate supply of the toner resins to Japanese makers of copying machines and toner, who have inaugurated production activities in the States.

The joint company will initially import resins from Japan until it completes manufacturing facilities in the U.S. It will use Sekisui's technology and the two parent companies' marketing capabilities.

Annual output of the factory to be built in 2 years at the earliest will be 5,000 tons, and expected sales for 1991, between Y1.5 million and 2.0 million.

UCCP is a major manufacturer of resins for coatings, ink and adhesives, and Sekisui Chemical is a leading toner-resin producer in Japan.

With regard to toner-resin operations in the States, two other Japanese companies — Fujikura Kasei and Mitsui Toatsu Chemicals, Inc. — have also established joint companies in the U.S. in partnership with Rohm and Haas and ICI Resin US, respectively.

NOVO ADVANCING INTO PROTEIN BUSINESS FOR BEVERAGES IN JAPAN

Novo Industri Japan Ltd. — Japanese subsidiary of Novo Nordisk (Denmark) — will advance into food-material business with a bean protein dubbed "pro up", for diversification. The company has already contracted with Japanese beverage makers to supply the bean protein on a regular basis.

Novo Industri Japan is a leading supplier in Japan of a variety of enzymes used for detergents, starch, textiles, dairy goods, juices and wine. It is the first time for the company to provide products other than enzymes in Japan.

It has been supplying "pro up" as samples to Japanese beverage makers since about one year ago and has recently obtained contracts for its regular supply. Healthcare drinks with "Pro up" in them are marketed in other countries.

In Japan, Asahi Breweries Ltd. began marketing last March a new beverage drink—"PF-21" — containing a protein supplied by another company. This drink has become the biggest-seller healthcare drink there with sales reaching as many as nearly 45 million bottles in about four months.

Novo intends to develop its protein business in Japan into a new, major line next to enzymes.

SEKISUI TO MARKET CANADIAN BOVINE SERUM FOR REAGENTS

Sekisui Chemical Co. will begin marketing in Japan fetal bovine serum (FBS) used for the manufacture of monoclonal antibodies and interferons, etc. under an exclusive sales agreement with Bocknek Ltd. of Canada.

The Japanese company intends to sell 5,000 litres of FBS in the initial year and 20,000 in the third, equivalent to 25 per cent of the domestic demand. It has obtained the exclusive sales rights for the Canadian firm's FBS for Japan. The Japanese FBS market last year was put at about Y3 billion, and is expected to triple in value within three years.

FBS is separated mainly from the blood serum of a milk-cow's fetus and has plenty of pure ingredients necessary for cultivating cells producing useful substances such as monoclonal antibodies and vaccines.

In Japan, Gibco-Oriental Inc. — a 50-50 joint venture of Oriental Yeast Co. and Life Technologies, Inc. (US) — and Flow Laboratories Japan Co. — Japanese subsidiary of Flow Laboratories (US) — are the major suppliers of FBS, but recently low-priced, low-quality FBS began appearing here reflecting strong demand for the substance.

Bocknek is the world's leading FBS supplier having built advanced production facilities with very clean rooms in 1987.

MARKET INFORMATION

Market Steady

Hydro and rangolite remain steady at the increased prices. Acrylamide eased further by Rs. 2 to Rs. 75 per kg. Ethyl acetate a NOCIL product moved up by Rs. 3 to Rs. 24 per kg. Methyl ethyl ketone and cellosolve came down the former by Rs. 10 and the latter by Rs. 4. Reclassification of import duty of dicyandiamide (DCDA) caused prices to go up to Rs. 65 per kg while it was being quoted earlier at Rs. 47 per kg.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent – and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on September 26, 1989)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	2.50
Ammonium phosphate (Mono)	14.50
Ammonium phosphate (Di)	14.00
Ammonium carbonate (Di)	17.00
Ammonium bicarbonate	5.60
Ammonium chloride	3.00
Ammonium nitrate	6.00
Arsenic white powder	22.00
Acrylamide (Resale)	75.00
Barium carbonate	6.00
Bleaching powder (33% Cl)	4.20
Borax (Granular)	15.00
Borax (Powder)	15.25
Boric acid (Tech)	28.00
Bisphenol-A	82.00
Butyl carbitol	110.00
Caustic soda (Flakes)	13.00
Caustic soda (Solid)	12.00
Caustic soda (Lye)	10.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	4.25
Calcium carbonate (Activated)	4.75
Cobalt oxide	280.00
Cresylic acid	52.00
Camphor (Indian)	105.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Belgium) (Resale)	47.00
Citric acid (Indian) (Resale)	47.00
Copper sulphate	24.00
Chromic acid	63.00
Ethylene urea	58.00
Ferric chloride (Lumps)	5.50
Ferric chloride (Anhydrous)	16.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17	115.00
Hydro	44+ST

Hyflosupercell	21.00
Hexamine (Resale)	35.00
Industrial Wax	25.00
Litharge	40.00
Lead Acetate (Tech.)	31.25
Lithopone	29.00
Magnesium chloride (Crystal)	2.25+ST
Menthol crystal (Flakes)	900+Ex+ST
Menthol bold	665+Ex+ST
Menthol crystal cold	700+Ex+ST
Magnesium carbonate (Japan)	16.00
Magnesium carbonate (Indian)	18.00
Maleic Anhydride (Resale)	38.00
Mercury (34.5 Kgs)	12,000.00
Nickel chloride	110.00
Oxalic acid (Resale)	22.00
Peppermint oil (Rectified)	195+Ex+ST
Potassium carbonate (Indian)	34.00
Potassium carbonate (Imported)	33.00
Potassium bichromate	32.50+ST
Potassium phosphate (Mono)	14.00
Potassium phosphate (Di)	14.00
Polyvinyl alcohol (No. 117)	115.00
Polyvinyl alcohol (No. 173)	120.00
Polyvinyl alcohol (No. 208)	150.00
Paraformaldehyde (Resale)	26+ST
Phthalic anhydride 36% (Resale)	25.50
Pentaerythritol (Resale)	45.00
Paraffin wax	18+ST
Rangolite (German)	90+ST
Rangolite (Czech.)	80+ST
Sodium sulphate (Fine)	6.00
Sodium sulphate (Coarse)	5.00
Sodium sulphide 50-52% (Flakes)	11+ST
Sodium sulphide 58-60% (Flakes) (TCL)	20.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	680.00
Sodium chlorite 80% (Spain)	88.00
Soda Ash (Tata)	5.00
Soda Ash (Birla)	4.50
Soda Ash (Imp.)	4.50
Sodium bicarbonate	7.50
Sodium bisulphite	4.50
Sodium silicate	3.00
Sodium acetate	5.00
Sodium alginate	250+ST
Titanium Dioxide (Anatase)	115+ST
Titanium Dioxide (Rutile – RCR_2)	150.00
Tartaric acid	100.00
Trisodium phosphate	5.50
Thiourea	77+ST
Urea (Tech.)	2.90
Vacuum salt	1.00
Zinc Dust	32.00
Zinc Oxide	52.00
Zinc chloride powder (Tech.)	12.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	14.00
Acetic Anhydride (Resale)	31.50
Acetone (Resale)	20.50
Adipic Acid	70.00
Aceto Acetanilide	55.00
Aniline Oil	70.00
Benzoate Plasticiser	62.00
Butyl acrylate	78+ST
Butyl stearate	50.00
Butanol	35+ST
Benzyl Alcohol	60.00
Benzyl Chloride	34.00
Benzo trichloride	16.00
Benzoyl chloride	22.00
Bromine Liquid	78.00
Chloroform	31.00
Carbon Tetrachloride	19.50
Cellosolve	60+ST
Cyclohexanone	56+ST
Cyclohexanol	58+ST
Diacetone (Resale)	34.00
Diethyl Oxalate	34.00
Diethyl glycol (DEG)	43.00
Dioctyl Phthalate	45.00
Diallyl Phthalate	56.00
Dimethyl Phthalate	28.00
Dioctyl Adipate	52.00
Dibutyl Adipate	42.00
Dipentene	15.00
Dimethylamine 40%	26.00
Dimethylamine 50%	30.00
Ethyl Acetate	24.00
Ethyl Acrylate	65.00
Ethylene Dichloride	14.50
Ethylene Glycol	45+ST
Formic Acid (Imp.)	24.00
Formaldehyde (Resale)	7.50
Glycerine (CP)	55.00
Glycerine (IW)	53.00
Hydrogen Peroxide 50% (Resale)	27.00
Isopropyl Alcohol	42.00
Isobutyl Alcohol (Resale)	30.00
Monoethanolamine (Resale)	65.00
Melamine	65.00
Methyl Ethyl Ketone	35+ST
Methyl Isobutyl Ketone	58.00
Methyl Acrylate	60.00
Methyl Dichloride (Resale)	26.00

Carbitol	68+ST
Meta Cresol	45.00
Nitrobenzene	30.50
Nitric Acid (Conc.) (RCF)	2.50
Ortho Cresol	30+ST
Phenol (Resale)	38.00
Propylene Glycol	55.00
Polyethylene Glycol (No.200)	58.00
Polyethylene Glycol (No.400)	63.00
Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	70.00
Polyethylene Glycol (No.6000)	85.00
Para Cresol	110.00
Styrene Monomer	35+ST
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	29.00
Triethanolamine (Resale)	65.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	47.50

SOLVENTS	Per Litre
Benzene	10.80
N-Heptane	10.50
N-Hexane	12.00
Methanol	10.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	20.00
Xylene	22.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	63.00
Alpha Naphthol (Imp.)	185.00
Aceto Acetic Ester (Methyl)	66.00
Ammonium Molybdate	215.00
Anthraquinone	130.00
Anthranilic Acid	78.00
2-Amino 4-Nitrophenol	140.00
Blue B. Base (Local)	255.00
Beta Naphthol (Atul)	75.00
Benzidine Dihydrochloride (BDH)	98.00
Bromamine Acid	600.00
BON Acid	130+Ex+Ta
Chicago Acid IRS	345.00
Coach Acid	60.00
C. Acid (Imp.)	210.00
Cyanuric Chloride	135.00
2,4- DNCB	31.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	72.00
Diethyl Aniline	180.00
Diamino stilbene disulphonic acid	165.00
3,3-DCB (Imp.)	180.00
Gamma Acid (Atul)	200.00
H. Acid (Atul)	125.00
G. Salt	78.00
Isophthalic Acid	45.00
J. Acid	365.00
J. Acid Urea	410.00
K. Acid	127.00
MPDS (German)	190.00
MNA	150.00
Meta Ureido Aniline	235.00
MPD (Local)	220.00
MPD (Japan)	250.00
Naphthenic Acid	40.00
N-Methyl J. Acid	620.00
N-Methyl Aniline	160.00
Naphthalene (Refined)	20.50
Ortho Anisidine (OA) (Imp.)	110.00
Ortho Dichloro Benzene (ODCB)	16.00
OT Base	120.00
Para Dichloro Benzene (PDCB)	29.00
Para Anisidine (PA local)	155.00
PNA	115.00
Para Cresidine (Imp.)	400.00
Para Amino Azo Benzene (India)	190.00
PNCB	55.00
Para Amino Acetanilide	195.00
1-Phenyl 3-Methyl 5-Pyrazolone	165.00
Phenyl J. Acid	365.00
Para Amino Benzoic Acid	135.00
PT Base	155.00
Rhoduline Acid	550.00
Resist Salt 80%	34.00
Resorcinol	210.00
Sodium Naphthionate	67.00
5-Sulpho-Anthranilic Acid	82.00
Sulphanilic Acid	50.00
Sulpho Tobias Acid	165.00
Trichloro Benzene (TCB)	22.00
Tobias Acid	165.00
Metanilic Acid	44.00
MTD	125.00

Bombay Dyes Market

(Prices as on September 26, 1989)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 3BN	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Congo Red N	117.05
Brill. Fast Helio II	362.85
Brill. Fast Helio 2R	385.85
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly. Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc	611.50
Red B 2B Conc	797.90
Red CB Powder	1048.25
Red D2B Powder	589.85
Violet C 4R Conc.	1202.70
Blue BG Conc	580.65
Blue BN Powder	128.20
Blue D 2R Powder	588.25
Navy BT Conc	531.95
Blue B 2G Conc	577.95
Black BT Conc	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128.40
Fast Scarlet R	198.05
Fast Scarlet RC	128.40
Fast Scarlet RCR	105.60
Fast Scarlet G	115.75
Fast Scarlet GN	92.95
Fast Scarlet GG	77.75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115.75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223.35
Fast Red RL	251.20
Fast Red KB Oil	251.20
Fast Bordeaux GP	236.00
Fast Garnet GBC	103.05
Fast Violet B	548.80
Fast Blue BB	546.50

NAPHTHOL COLOURS	Per Kg
ASG	301.85
AS	205.85
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.40
ASOL	241.15

ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2002.35
ASBT	2459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow MGR	387.65
Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M3R	244.70
Brill. Orange H2R	303.80
Brill. Red H7B	157.95
Brill. Orange M2R	313.15
Brill. Red H8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H3R	333.75
Blue H 5RX	286.20
Navy Blue M3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Conc	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Powder Fine	675.30
Blue BC Acra Con Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Powder Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D. Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: SEPT. 22, (NNS) Menthol flake medium and bold spurted sharply by Rs. 15/17 at Rs. 315, Rs. 340 and Rs. 367 per kg respectively in the Delhi chemical market during the week under review on account of increased hoarding tendency by stockists and fall in arrivals from U.P. As a result of increased stocking tendency by the traders of Sambhal, Moradabad, Chandausi and Amroha, mentha oil went up sharply by Rs. 25 at Rs. 245/255 per kg. Menthol flake Sept. and Diwali delivery hardened by Rs. 5 each at Rs. 320 and Rs. 330.

On account of poor demand from plastic and paint units as well as increased selling pressure by stockists titanium dioxide anatase and K brand came down by Rs. 3/4 at Rs. 114 and Rs. 102 per kg respectively. RC-822 and RC-2 titanium also dropped sharply by Rs. 5 at Rs. 153 each per kg. Due to improved supply, camphor powder and thal drifted lower by Re. 1 at Rs. 101 and Rs. 109 per kg.

Mercury suffered a fall of Rs. 100 at Rs. 11,300 per flask on account of increased offerings as well as discouraging advices from Bombay. Offtake was also poor by consumers. Chatkolite and sufolite slipped by Rs. 2 at Rs. 78 per kg owing to keen offerings but later in the face of increased demand by the gurkhandsari manufacturers, chatkolite improved by Rs. 2 at Rs. 80/kg and sufolite was traded at Rs. 79. Rangolite Germany ruled quiet at their previous closing of Rs. 100 per kg.

Sodium hydrosulphite Tamilnadu, Demosha and Kalali eased slightly by 25/50 paise at Rs. 36 each and Rs. 37 per kg respectively due to better supply. Citric acid thin advanced by Rs. 25/50 at Rs. 2,175 and Rs. 2,250 per 50 kg due to fall in imports from China and Indonesia while bold citric of Bombay Dyeing declined by Rs. 25 at Rs. 2,475 due to fall in demand. As a result of tight supply, caustic flake rose from Rs. 565/570 to Rs. 575 per bag. Boric acid technical registered a gain of Rs. 25 at Rs. 1,450 on tight stock position. Sodium sulphate D.C.M. black and red marka jumped up by Rs. 250 at Rs. 3,600 and Rs. 3,800 in the absence of inflow from Kota. Sodium sulphate Gwalior Rayon moved up by Rs. 50 at Rs. 3,300. Sodium phosphate jumped up from Rs. 490 to Rs. 550 followed by higher advices from Bombay and South. Phosphoric acid looked up by Rs. 25 at Rs. 1,050. Other chemicals, dyes and colours ruled quiet at their previous closing.

(DELHI MARKET RATES AS ON SEPTEMBER 22, 1989)

Ammonia Bicarb (Per 25 Kg.)	150.00
Mercury (Per flask)	11,300.00
Soda ash (Per bag)	335/355.00
Ammonium Chloride (50 Kg.)	110/180.00
Caustic soda flakes (50 Kg.)	575.00
Citric acid (Per 50 Kg.)	2,175/2,475.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	100.00
Stable Bleaching Powder KCl (Per 25 Kg.)	95.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	90.00
Stable Bleaching Powder Modi (Per 25 Kg.)	98.00
Sodium Bicarbonate (50 Kg.)	290/300.00
Sodium Hydrosulphite (Per Kg.)	34.00/37.00
Rangolite (Per Kg.)	79.00/100.00
Boric acid Technical (Per 50 Kg.)	1,450.00
Paraffin Wax (Per 50 Kg.)	900.00
Tartaric Acid (Per 50 Kg.)	14,000.00
Borax Granular (Per 50 Kg.)	700.00
Borax Crystal (Per 50 Kg.)	710.00
Sodium Nitrite (Per 50 Kg.)	700/760.00
Sodium Nitrate (Per 50 Kg.)	425.00
Camphor Thal (Per Kg.)	109.00
Camphor Powder (Per Kg.)	101.00
Menthol Bold (Per Kg.)	367.00
Menthol Medium (Per Kg.)	340.00
Menthol Flake (Per Kg.)	315.00
Glycerine (Per Kg.)	55/58.00
Sodium Silicate (Per quintal)	275/350.00
Hexamine (Per Kg.)	33.50
Acetic Acid Glacial (Per Kg.)	15.00
Copper Sulphate (Per quintal)	2,400/2,750
Formic Acid (Per Kg.)	25.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	28.50
Calcium Carbonate (Per Tonne)	2,500/4,000
Acid Slurry Soft (Per Kg.)	28.00
Acid Slurry Hard (Per Kg.)	38.00
Phosphoric Acid (Per 50 Kg.)	1,050.00
Potassium Nitrate (Per quintal)	900/1,200.00
Potassium Permanganate (Per 50 Kg.)	2,800/3,200.00
Sodium Bichromate (Per 50 Kg.)	1,575/1,600.00
Trisodium Phosphate (50 Kg.)	550.00
Titanium Dioxide Anatase (Per Kg.)	114.00
Titanium Dioxide RC-822 (Per Kg.)	153.00
Titanium Dioxide K-Brand (Per Kg.)	102.00
Titanium Dioxide RCR-2 (Per Kg.)	153.00
Zinc Oxide (Per metric tonne)	42,000/52,000.00
Phenol Carbolic Acid (Per Kg.)	37.00
Carbon Tetrachloride (Per Kg.)	24.25
Chloroform (Per Kg.)	28.00
Sodium Sulphate (Per metric tonne)	3,300/3,800.00
Naphthalene Balls (Per 50 Kg.)	1,325.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/201.65
Naphthol ASG	180/295.20
Naphthol ASBS	210/248.45
Naphthol ASTR	265/360.45
Naphthol ASOL	210/238.60
Naphthol ASBO	195/260.75

DIRECT DYES	(Per Kg.)
Black E. Conc.	110/176.90
Diazo Black B.T.	105/147.55
Green B	90/140.55
Blue 2-B	60/101.40
Blue 2-B 225% (JNR)	125.00
Sky Blue FB	160/235.05
Basic Auramine	55/110.00
Basic Rhodamine	300/425.00
Basic Methylene Blue	100/180.00
Basic Violet	150/180.00
Basic Malachite Green	150/165.00
Acid Orange	75/111.20
Congo Red H/C	75/120.95

Madras Market

Markets were dull and lacked support from buyers. Caustic soda flakes availability was better and both Mettur and Andhra Sugars dropped their prices to Rs. 590/bag due to other manufacturers' unloading supplies at lower rates. Trisodium phosphate prices dropped to Rs. 400/bag on better availability. There is a pressure selling in acetic acid as the local unit Southern Hydrocarbons Ltd. which was under closure over a long period has commenced production and its production has become available. There is keen selling amongst producers and agents.

(MADRAS MARKET RATES AS ON SEPTEMBER 23, 1989)

Acetic Acid Glacial (per kg)	16.00
Aluminium Sulphate Iron free (per MT)	3,800.00
Ammonium Bicarbonate (per 25 kgs)	130.00
Ammonium Chloride (per MT)	3,000.00
Acid Slurry (per kg)	30.00
Barium Carbonate (per kg)	6.25
Barium Chloride (per kg)	5.50
Boric Acid Technical (per kg)	24.00
Bleaching Powder (per 50 kgs)	220.00
Borax (per 50 kgs)	685.00
Caustic Soda Flakes -- Mettur Chemicals (per MT)	11,800.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	11,800.00
Calcium Chloride 70% Solid (per MT)	3,000.00
Calcium Chloride Anhydrous (per MT)	5,500.00
Calcium Carbonate (Activated) (per MT)	5,750.00
Calcium Carbonate (Precipitated) (per MT)	4,750.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	24.00
Cresylic Acid 98-99% (per kg)	125.00
Pure Para Cresol 96% (per kg)	80.00
Meta Para Cresol 42% (per kg)	52.00
Formic Acid (per kg)	26.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine (per kg)	49.00
Hydrosulphite of Soda (TCPL) (per kg)	37.00
Hydrosulphite of Soda (IDI) (per kg)	41.00
Hydrosulphite of Soda (BASF) (per kg)	41.00
Hexamine (per kg)	29.00
Hyflo Supercell (per kg)	21.00
Hydrogen Peroxide (per kg)	29.50
Litharge (per kg)	40.00
Lead Acetate (per kg)	42.00
Magnesium Carbonate (per kg)	19.00
Magnesium Chloride (per kg)	3.00
Maleic Anhydride (per kg)	38.00
Menthol Crystals (per kg)	400.00
Oxalic Acid (per kg)	24.00
Paraffin Wax (per kg)	19.00
Potassium Bichromate (per kg)	36.00
Phosphoric Acid (per kg)	25.00
Polyvinyl Alcohol powder (per kg)	128.00
Pentaerythritol (per kg)	52.00
Phthalic Anhydride (per kg)	29.00
Soda Ash (TAC) (per 75 kgs)	385.00
Soda Ash (TATA) (per 75 kgs)	385.00
Sodium Bicarbonate (TATA) (per 50 kgs)	375.00
Sodium Silicate (per MT)	3,350.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	12.00
Sodium Bisulphite (per kg)	4.75
Sodium Alginate (per kg)	225.00
Sodium Acetate (per kg)	7.50
Sodium Sulphate (Anhydrous) (per kg)	3.00
Titanium Dioxide (Anatase) (per kg)	105.00
Titanium Dioxide (Rutile) (per kg)	125.00
Trisodium Phosphate (per bag)	400.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	54.00
Zinc Chloride Powder (per kg)	12.50
Zinc Sulphate (per kg)	8.00

SOLVENTS

Acetone -- HOCL (per kg)	23.00
Butanol (per kg)	36.00
Butyl Acetate (per kg)	42.00
Benzene (per lit)	16.00
Cellosolve (per kg)	50.00
Carbon Tetra Chloride (per kg)	23.00
Chloroform (per kg)	28.00
Diacetone Alcohol (per kg)	30.00
Diethylene Glycol (per kg)	47.00
Dichloroethane (per kg)	17.00
Di-octyl Phthalate (per kg)	47.00
Di-N-butyl Phthalate (per kg)	49.00
Ethyl Acetate (per kg)	21.00
Isopropyl Alcohol (per kg)	32.00
Methanol (per kg)	11.00
Methylene Chloride (per kg)	23.00
Methyl Ethyl Ketone (per kg)	38.00
Methyl Isobutyl Ketone (per kg)	55.00
Phenol (per kg)	36.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	60.00
Trichloroethylene (per kg)	25.00
1-1-1 Trichloroethane (per kg)	27.00
Turpentine (per lit)	16.50
Toluene (per lit)	22.00
Xylene (per lit)	23.00

International Bulk Chemical Prices

Spot Prices are as on September 6, 1989

Naphtha prices settled at $155-157/ton cif NWE. Ethylene slipped to $300-320 cif NWE with low trading activity. Butadiene prices remained unchanged though supply position was extremely tight. Benzene went down marginally to $325-330/fob NWE. Arrival of imported materials from U.S. and U.S.S.R. is causing the bearish tendencies. Toluene which had been bouyed by demand from gasoline blenders, came down to $240-245/ton fob NWE with little business concluded. Paraxylene remained stable at 640-650/ton.

Orthoxylene dropped to $315-320/ton fob NWE with interest from Middle East and Far East fading away. Xylene prices came down following excess inventories. Styrene prices also came down with T1 being quoted at $640-650/ton cif NWE. US imports arriving into Europe seems to be the cause of the downward pressure. Methanol continued to fall with further drops expected.

Product	European Spot price range $/ton	US price range $/ton
Ethylene	300-320 (cif)	n.a
Propylene (100% basis)	361-381 (cif)	n.a.
Butadiene	400-405 (fob)	551-595 (spot)
Benzene	325-330 (fob)	299-300 (spot)
Toluene	240-245 (fob)	234-237 (spot)
Xylenes (virgin)	295-300 (fob)	264-266 (spot)
(solvent)	290-295 (fob)	n.a.
Styrene	700-710 (T2)(fob)	573-617 (spot)
	640-650 (T1) (cif)	
Paraxylene	640-650 (fob)	n.a.
Orthoxylene	315-320 (fob)	n.a.
Ammonia	98-102 (c&f)	n.a.
Methanol	62- 65 (T2)(fob)	n.a.
	50- 55 (T1)(cif)	
Naphtha	155-157 (cif)	n.a.

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
29/9	Eagle Moon (V-018)	F.F.C. Co.	Los Angeles (Harbour); Longbeach; Sanfrancisco; Oakland; Seattle; Vancouver (B.C.); Portland; New York; Boston; Norfolk; Baltimore; Charleston; Savannah; Miami; New Orleans; Houston; Montreal; Toronto; Fortworth; Chicago; Nashville; Atlanta; Philadelphia; Milwaukee; Kansas City; Phoenix; Guam; Dallas; Cleveland; St. Louis; Cincinnati; Denver; Louisville; Memphis; Wilmington (B.C.); San Diego; Minneapolis; Indianapolis and Central American Ports; Honolulu. (Carting at Timber Pond No. 1).	4/10
30/9	Uni Pioneer (Voy-014)	Greenways	New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Providence (RI); Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Bermuda; Los Angeles; Longbeach; Sanfrancisco; Oakland; San Diego; Stockton; Richmond; Almeida; Redwood City; Sacramento; Seattle; Portland; Vancouver (B.C.); Tacoma; Longview; Chicago; Dallas; Various inland destinations and Caribbean ports. (Carting at G/H Cotton Depot).	5/10

(1)	(2)	(3)	(4)	(5)
2/10	Orient Triumph (Cyp)(Voy-314)	Transworld	Los Angeles; Longbeach; Sanfrancisco; Oakland; Seattle; Vancouver; New York; Boston; Toronto; Montreal; Philadelphia; Norfolk; Baltimore; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston. (Carting at CFS Cotton Avenue).	6/10
2/10	Orient Triumph (V-314)	Transworld	Monrovia; Lome; Lagos; Douala; Tema; Takordi; Abidjan; San Pedro. (Carting at CFS Cotton Avenue).	6/10
30/9	Uni Pioneer (V-014)(Pan)	Greenways	Hamburg; Felixstowe; Rotterdam; Antwerp; Le Havre; London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leeds; Leicester; Amsterdam; Bremen; Copenhagen; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast and all destinations in U.K., Germany; Switzerland and Austria. (Carting at G/H Cotton Depot).	5/10
2/10	Orient Triumph (Cyp)(Voy-314)	Transworld	Hodeidah; Djibouti; Port Sudan; Jeddah; Assab; Masawa; La Spezia; Naples; Malta; Beirut; Tartous; Mersin; Marseilles; Genoa; Valencia; Fos; Leghorn; Tilbury; London; Liverpool; Avonmouth; Birmingham; Manchester; Leeds; Dublin; Belfast; Antwerp; Hamburg; Bremen; Rotterdam; Le Havre; Aarhus; Gothenburg; Helsingborg. (Carting at CFS Avenue).	6/10
29/9	Eagle Moon	F.F.C. Co.	Jeddah; P. Sudan; Hodeidah. (Carting at Timber Pond No. 1).	4/10
28/9	A.S. Okan (Tur)	U.L.A.	Jeddah; Turkish Ports.	5/10
26/9	Sidi Krier	M.C.S.	P. Suez; P. Said; Jeddah.	6/10
30/9	Tilia	U.L.A.	P. Sudan; Aden; Djibouti; Hodeidah. Carting at 14-VD for Containers).	5/10
29/9	Eagle Moon	F.F.C. Co.	Colombo, Rangoon. (Carting at Timber Pond No. 1).	4/10
30/9	New Dalia	Worldlink	Karachi; (Afghanistan).	6/10
2/10	Kalidas	S.C.I.	Chittagong. (Carting at Timber Pond No. 1).	4/10
29/9	Eagle Moon (V-018)(Ger)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta (T. Priok); Hongkong; Manila; Busan; Keelung; Kaohsiung; Kobe; Yokohama; Nagoya; Osaka; Tokyo; Tsingtao; Dairen; Quangzhou; Whampoa; Shanghai; Hsingkang. (Carting at Timber Pond No. 1).	4/10
30/9	Uni Pioneer (V-014)(Pan)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Pusan; Hongkong. (Carting at G/H Cotton Depot).	5/10
28/9	Vermilion Bay (V-06)(Pan)	Samrat/	Singapore (Direct); Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok; Manila; Hongkong; Kaohsiung; Keelung; Taichung; Busan; Yokohama; Nagoya; Kobe; Osaka; Tokyo. (Crtg. at Mallet Bunder).	3/10
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at 7-W/H-PD).	
		U.L.A./	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan and Chinese ports. (Crtg. M-171/173 CD).	
		E.S.P.L.	Dalian; Quindao; Tianjin (Xiangang); Nawtong; Shanghai; Ningbo; Xiamen; Fuzhou; Guangzhou; Whampoa; Vietnam. (Carting at M.B.).	
		Transworld/	P. Kelang; Penang; Keelung; Kaohsiung; Busan; Bangkok; Kobe; Yokohama; Nagoya; Tokyo; Shimizu. (Crtg. at M-178/180 C.D.).	
		I.M.E./	Singapore; Bangkok; Hongkong; Keelung; Busan; Kobe; Yokohama; Nagoya. (Carting at Wadi Bunder No. 3).	
		Silver Ship	Singapore; Far East and Japan Ports. (Carting at 19-ID).	
29/9	Kamnik (Yug)	Depe	Hongkong; Keelung; Kaohsiung; Kobe; Yokohama; Busan.	5/10
2/10	Kalidas	S.C.I.	Singapore and other Far East Ports. (Carting at Timber Pond No. 1)	4/10
29/9	Eagle Moon	F.F.C. Co.	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. Crtg. at T.P. No. 1).	4/10
2/10	Kalidas	S.C.I.	Melbourne; Fremantle; Adelaide; Sydney. (Crtg. at Timber Pond No. 1).	4/10
2/10	Orient Triumph (V-314)(Cyp)	Transworld/	Sharjah; Dubai; Abu Dhabi; Ajman; Doha; Kuwait; Dammam; Baghdad; Basrah; Syria and inland destinations in Gulf. (Crtg. CFS Cot. Ave.).	6/10
		Sai Ship	Dubai; Muscat; Sharjah; Abu Dhabi. (Carting at Wadi Bunder No. 3).	
29/9	Eagle Moon (V-018)	F.F.C. Co.	Dubai; Sharjah; Abu Dhabi; Doha; Muscat; Dammam; Riyadh; Bahrain; Kuwait. (Carting at Timber Pond No. 1).	4/10
30/9	Banglar Robi	Sai Ship	Dubai. (Carting at Wadi Bunder No. 3).	7/10
30/9	Tilia (V-60)	U.L.A.	Dubai; Dammam; Kuwait; Bahrain; Riyadh; Abu Dhabi; Doha. (Carting at 14-VD for Containers only).	5/10
30/9	Bander E Deylam	Worldlink	Sharjah.	8/10

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
6/10	Vishva Karuna	S.C.I.	Constanza

Materials Imported

MADRAS
(From 1.8.89 to 5.8.89)
(Contd. from previous issue)

PARA HYDROXY ACETOPHENONE: From FRG: Neuland Lab Ltd., 2,400 Kgs., Rs. 5,78,907.

HYDROXYLAMINE SULPHATE: From FRG: Siris Ltd., 36 MTs., Rs. 9,26,449; STD Organics Ltd., 54 MTs., Rs. 13,89,668.

4 HYDROXY BENZYL CYANIDE: From UK: IEL Ltd., 0.01 Kgs., Rs. 30.

HYDROXY PHENYL ACETAMIDE: From UK: IEL Ltd., 546 Kgs., Rs. 6,45,234.

ISOCYANATE: From UK: Roloforms Polymers Ltd., 17,500 Kgs., Rs. 7,07,038.

LITHIUM CARBONATE: From USA: Tribology India Ltd., 1,000 Kgs., Rs. 64,897.

MAGNESIUM OXIDE: From Japan: Sundaram Inds., 1,000 Kgs., Rs. 32,532.

METHYLENE CHLORIDE: From Japan: Plant Organics Ltd., 16,500 Kgs., Rs. 1,76,172.

2,6 METAXYLIDINE: From Switzerland: Astra IDL Ltd., 2,000 Kgs., Rs. 2,37,425.

MONO ISOPROPYLAMINE: From UK: IEL Ltd., 2,760 Kgs., Rs. 49,268.

NITROGEN: From France: Cegelec India Ltd., 3 Bottles, Rs. 1,511.

POLYDIMETHYL SILOXANE: From USA: IEL Ltd., 200 Kgs., Rs. 41,029.

POTASSIUM BROMIDE: From UK: Indian Oil Corpn. Ltd., 400 Gms., Rs. 7,000.

POTASSIUM SILICATE SOLN: From France: Suchitra Teletubes Ltd., 108 MTs., Rs. 8,97,600.

PYRIDINE PURE 1°: From Belgium: Priya Chemicals, 8 Kgs., Rs. 5,53,874.

SODIUM HYDROXYSULLPHITE: From FRG: Siris (I) Ltd., 10.200 MTs., Rs. 2,12,708.

SODIUM METAL: From Japan: Priya Chemicals, 8.06 MTs., Rs. 2,95,822.

SODIUM METHOXIDE: From FRG: Dr. Reddy's Laboratories Ltd., 9,000 Kgs., Rs. 4,23,253.

SODIUM PERSULPHATE: From FRG: Hi Q Electronics Pvt. Ltd., 2,000 Kgs., Rs. 50,300.

STANNOUS OCTOATE: From FRG: Joy Foam Pvt. Ltd., 600 Kgs., Rs. 94,312.

TRICHLORO ETHYLENE: From France: Kunal Engineering Co. Ltd., 5,900 Kgs., Rs. 79,729.

TRIMETHOXY BENZALDEHYDE: From Japan: Prasad Drugs Pvt. Ltd., 540 Kgs., Rs. 2,03,869.

ZINC OXIDE: From USA: MRF Ltd., 90 Kgs., Rs. 15,652.

DRUG MATERIALS IMPORTED MADRAS
(From 1.8.89 to 5.8.89)

CHLOR PHENIRAMINE MALEATE BP/USP: From China: Medopharm, 400 Kgs., Rs. 2,71,932.

MANNITOL USP: From Brazil: Muthu Meena Agencies, 5,000 Kgs., Rs. 1,58,488.

PARACETAMOL BP 80: From China: Tamil Nadu Dadha Pharmaceuticals Ltd., 8,825 Kgs., Rs. 7,21,413.

PLASTIC MATERIALS IMPORTED, MADRAS
(From 1.8.89 to 5.8.89)

EPOXY RESIN: From USA: Metkem Silicon Limited, 200 Sets,

Rs. 22,306.

HDPE: From Singapore: Integrated Exports, 68,000 Kgs., Rs. 8,46,424; From USA: Lalith Polypacks Pvt. Ltd., 16 MTs., Rs. 2,26,394.

MEDIUM DENSITY PE: From Sweden: Hindustan Cables Ltd., 32.5 MTs., Rs. 8,97,396.

POLYPROPYLENE: From Belgium: Barita Moulders Pvt. Ltd., 15,000 Kgs., Rs. 2,94,037; Kunal Engg. Co. Ltd., 30 MTs., Rs. 5,40,528; From UK: Alsa International, 15,750 Kgs., Rs. 3,[illegible],000, From USA: Super Packers, 20.25 MTs., Rs. 3,27,695; From Australia: MM Rubber Co. Ltd., 48,000 Kgs., Rs. 8,08,790; From FRG: G.K. Trade Co., 14.514 MTs., Rs. 2,29,268; From Italy:Amco Batteries Ltd., 15 MTs., Rs. 3,06,550; From Japan: Super Twines, 16,000 Kgs., Rs. 2,72,224; From Portugal: Ultramarine & Pigments Ltd., 96 MTs., Rs. 14,40,018; From Singapore: Hindustan Plastics Pvt. Ltd., Rs. 3,75,367.

16 MTs., Rs. 2,53,581; Integrated Exports, 30,000 Kgs., Rs. 4,00,392; Pandiyan Polymers Pvt. Ltd., 32,000 Kgs., Rs. 5,45,982; Sindu Packages, 16,000 Kgs., Rs. 2,74,935; From Spain: Tulsyan Synthetics Ltd., 96 MTs., Rs. 14,38,636; From USA: MM Rubber Co. Ltd., 60,000 Kgs., Rs. 10,41,018; VPS Ayyemperumal Nadar & Sons, 17 MTs., Rs. 2,76,826.

POLYSTYRENE: From Korea: Andhra Polymers Ltd., 12 MTs., Rs. 3,25,557; Vijayalakshmi Enterprises, 2,04,000 Kgs., Rs. 29,77,910.

POLYURETHANE RESIN: From UK: Polynova Inds. Ltd., 4,040 Kgs., Rs. 2,02,749.

MATERIALS IMPORTED MADRAS
(From 7.8.89 to 10.8.89)

ACETANILIDE: From Hungary: Dolphin Drugs Pvt. Ltd., 15 MTs., Rs. 2,31,818; Savera Labs. Pvt. Ltd., 17,690 Kgs., Rs. 4,52,776.

ACETONITRILE: From Belgium: IDPL., 12.09 MTs., Rs. 2,04,295.

N-ACETYL SULPHANILYL CHLORIDE: From Japan: Metro Exporters Ltd., 40 MTs., Rs. 21,35,420.

AROMATIC CHEMICALS: From Switzerland: The Chemical Engg. Co., 100 Kgs., Rs. 49,699; N. Ranga Rao & Sons, 945 Kgs., Rs. 2,91,002; Padmini Products, 400 Kgs., Rs. 1,55,444.

PARA TERTIARY BUTYL PHENOL: From FRG: SIP Resins Ltd., 6,000 Kgs., Rs. 1,42,778.

CAPROLACTAM: From Netherlands: Shriram Fibres Ltd., 493 MTs., Rs. 1,52,97,948.

CYSTEAMINE HCL 75% SOLN: From Japan: Globe Organics Ltd., 16 MTs., Rs. 17,56,534.

DIMETHYL SULPHOXIDE: From France: Globe Organics Ltd., 47,880 Kgs., Rs. 12,78,049; From USA: Prasad Drugs Pvt. Ltd., 8,845 Kgs., Rs. 2,31,818; Savera Labs. Pvt. Ltd., 17,690 Kgs., Rs. 4,52,776.

DINITRO ORTHO CRESOL: From France: Mcdowell & Co. Ltd., 5,538 Kgs., Rs. 3,13,820.

EPICHLOROHYDRINE: From Japan: Synthokem, 4,800 Kgs., Rs. 1,42,219.

ETHANOLAMINE: From Singapore: Micropack Ltd., 320 Ltrs., Rs. 14,036.

HYDROCHLORIC ACID: From Singapore: Micropack Ltd., 600 Ltrs., Rs. 36,709.

HYDROGEN PEROXIDE: From Singapore: Micropack Ltd., 180 Ltrs., Rs. 10,064.

D(-) PARA HYDROXY PHENYL GLYCINE: From Singapore: Aurobindo Pharma Pvt. Ltd., 1,000 Kgs., Rs. 3,58,684.

HYDROXYLAMINE SULPHATE: From Japan: Bell Remedies, 35 MTs., Rs. 9,57,662.

ISO BORNYL ACETATE: From DR: Sri Venkateswara Chemical, 10 Ts., Rs. 1,91,216.

ISOBUTYL BENZENE: From UK: PS Labs. Pvt. Ltd., 6,840 Kgs., s. 3,83,561.

ISO EUGENOL: From Indonesia: . Ranga Rao & Sons, 200 Kgs., s. 30,864.

METHYL PARATHION TECH)%: From GDR: Bangalore Pesticides d., 16.12 MTs., Rs. 5,51,588.

METHYLENE CHLORIDE: From rance: Standard Organics Ltd., 59,280 gs., Rs. 6,27,994; From Netherlands: olphin Drugs Pvt. Ltd., 79.56 MTs., s. 8,16,288.

MONOCHLORO ACETIC ACID: rom USA: Shasun Drugs, 13,650 Kgs., s. 3,23,822.

MONOCROTOPHOS TECH: From vitzerland: Gujarat Agro Chemicals, ,280 Kgs., Rs. 13,78,868.

OCTAMETHYL CYCLO TETRA LOXANE: Anabond Pvt. Ltd., 2,000 gs., Rs. 1,00,098.

PHOSPHORIC ACID: From Singa- re: Micropack Ltd., 420 Ltrs., . 26,728.

POTASSIUM HYDROXIDE: From ngapore: Micropack Ltd., 560 Ltrs., . 32,265.

PROPYLENE GLYCOL: From A: Bush Boake Allen (India) Ltd., 540 Kgs., Rs. 7,34,685; From Japan: phtha Resins & Chemicals Pvt. Ltd., 170 Kgs., Rs. 3,53,390.

PYRIDINE PURE 2°: From Japan: ll Remedies, 3,900 Kgs., 2,59,788.

SILICON CARBIDE: From rway: Carborundum Universal Ltd., 00 Kgs., Rs. 1,44,192.

ILICON METAL: From Singapore: sha International, 19.793 MTs., Rs. 2,88,930.

SODIUM HYDROSULPHITE: From China: Dolphin Drugs Pvt. Ltd., 10 MTs., Rs. 2,25,220.

SULPHUR: From Malaysia: Kerala Rubber & Reclairs Ltd., 25 Kgs., Rs. 482.

SULPHURIC ACID: From Singapore: Micropack Ltd., 420 Ltrs., Rs. 17,905.

TERTIARY BUTANOL: From FRG: Peroxides India Ltd., 12,090 Kgs., Rs. 2,66,194.

TERTIARY BUTYLAMINE: From Belgium: TPS Labs Pvt. Ltd., 675 Kgs., Rs. 39,225.

TITANIUM DIOXIDE: From Switzerland: Vijay Paints & Pigments Ltd., 210 Kgs., Rs. 21,707.

TRIMELLITIC ANHYDRIDE: From USA: Polymers & Allied Products, 2,250 Lbs., Rs. 44,857.

PLASTIC MATERIALS IMPORTED MADRAS (From 7.8.89 to 10.8.89)

HEPE: From Japan: Sri Gopalakrishna Poly Inds., 20 MTs., Rs. 3,20,350; Sumitra Plastics Ltd., 1,50,000 Kgs., Rs. 24,57,951; From Singapore: ABC Corpn., 5,00,000 Kgs., Rs. 50,80,310; Amman Polysacks Pvt. Ltd., 34 MTs., Rs. 4,67,170; Gem Properties Pvt. Ltd., 51 MTs., Rs. 6,81,532; From USA: Lalith Polypacks Pvt. Ltd., 16 MTs., Rs. 2,26,394.

POLYPROPYLENE: From Netherlands: Buildmet Fibres, 64 MTs., Rs. 7,95,444; Polypack Inds., 32 MTs., Rs. 3,92,722; From Singapore: Ananth Plastics Pvt. Ltd., 16,000 Kgs., Rs. 2,53,582; Integrated Exporters, 38,000 Kgs., Rs. 5,65,669; Propyfilm Inds., 31,000 Kgs., Rs. 5,29,800; Siva Plastic Inds., 15,500 Kgs., Rs. 2,65,381.

STYRENE MONOMER: From FRG: Naphtha Resins Fine Chemicals Pvt. Ltd., 30.4 MTs., Rs. 5,45,200.

MATERIALS IMPORTED MADRAS
(From 18.8.89 to 24.8.89)

ACEANILIDE: From FRG: Siris Limited, 67.200 MTs., Rs. 11,37,698.

ACETYL CHLORIDE: From FRG: Shasun Drugs, 16,440 Kgs., Rs. 3,56,036.

N-ACETYL SULPHANILYL CHLORIDE: From Japan: Sreepathi Pharmaceuticals Pvt. Ltd., 12.500 MTs., Rs. 6,77,746.

ALDEHYDE C-9: From FRG: Aromatic India, 35 Kgs., Rs. 21,608.

ALLYL CAPROATE: From UK: Bush Boake Allen (India) Ltd., 300 Kgs., Rs. 58,144.

ALUMINIUM OXIDE: From FRG: Carborundam Universal Ltd., 1,450 Kgs., Rs. 31,149.

AMMONIUM PENTABORATE: From Japan: Keltron Component Complex, 2,500 Kgs., Rs. 1,35,159.

AROMATIC CHEMICALS: From France: Rajashree Trading Co., 300 Kgs., Rs. 39,290; From Netherlands: N. Ranga Rao & Sons, 175 Kgs., Rs. 56,769; From Switzerland: TSR and Co., 175 Kgs., Rs. 57,295.

BARBITURIC ACID: From FRG: Babros Chemicals Pvt. Ltd., 400 Kgs., Rs. 61,727.

PARA TERTIARY BUTYL PHENOL: From USA: Reichhold Chemicals India Ltd., 12.996 MTs., Rs. 3,03,537.

O-CHLORO BENZALDEHYDE: From Japan: Agipi Chemicals, 4,140 Kgs., Rs. 3,31,550.

CHLOROPYRIDINE: From Japan: Venkatrama Chemicals Ltd., 4,800 Kgs., Rs. 11,74,034.

DICUMYL PEROXIDE: From Belgium: Dadha Hewlette Finance & Estate, 100 Kgs., Rs. 2,336.

DIPROPYLENE GLYCOL: From USA: Brakes India Ltd., 32.404 MTs., Rs. 7,12,774.

ETHYL GLYCOL: From USA: Addisons Paints & Chemicals Ltd., 18,000 Kgs., Rs. 3,96,185.

ERYTHROMYCIN THIOCYANATE: From USA: Pradeep Drug Company, 989.4 Kgs., Rs. 11,85,249.

ETHYLENE GLYCOL: From FRG: Elcot New Era Technologies Ltd., 5,720 Kgs., Rs. 1,47,690.

ETHYLENE VINYL ACETATE: From Belgium: Dadha Hewlette Finance & Estate, 3,000 Kgs., Rs. 42,542.

FLUOBORIC ACID: From China: Rao Insulating Co. Pvt. Ltd., 275 Lbs., Rs. 4,481.

HEXAMETHYLENE DIAMINE ADIPATE: From FRG: SRF, 35,000 Kgs., Rs. 10,62,406.

HYDRAZINE HYDRATE 80%: From USA: Standard Organics Ltd., 15,200 Kgs., Rs. 4,69,125.

HYDROXYLAMINE SULPHATE: From Japan: Siris Limited, 17.500 MTs., Rs. 4,55,721; Standard Organics Ltd., 35 MTs., Rs. 9,57,662.

D-PARA HYDROXY PHENYL GLYCINE: From Singapore: TTK Chemicals Ltd., 1,000 Kgs., Rs. 3,67,026.

ISOBUTYL BENZENE: From USA: Cheminor Drugs Pvt. Ltd., 40,971 Kgs., Rs. 22,21,433.

LILIAL: From Switzerland: N. Ranga Rao & Sons, 570 Kgs., Rs. 1,47,672.

LINALOOL: From Switzerland: Karnataka Soaps & Detergents Ltd., 2,000 Kgs., Rs. 2,79,002.

LITHOPONE: From China: Tirupathi Inds., 17,700 Kgs., Rs. 88,586.

LINALYL ACETATE: From France: N. Ranga Rao & Sons, 150 Kgs., Rs. 25,689.

MAGNESIUM OXIDE: From Japan: Saraswathy Rubber Products, 1 MT., Rs. 29,196.

METHYL ACETO ACETATE: From Japan: Vani Chemicals & Intermediates Pvt. Ltd., 32,000 Kgs., Rs. 8,15,196.

METHYL CYCLOHEXYL ACETATE: From UK: Asian Peroxide Ltd., 1,800 Kgs., Rs. 1,11,636.

METHYLENE CHLORIDE: From France: Chemicals Ltd., 19,000 Kgs., Rs. 2,01,280.

MURIATE OF POTASH: From FRG: Indian Potash Ltd., 30,000 MTs., Rs. 6,92,73,965.

PEPTONE: From China: Rao Insulating Co. Pvt. Ltd., 45 Lbs., Rs. 5,032.

PHOSPHORIC ACID: From USA: Madras Fertilizers Ltd., 5,523.111 MTs., Rs. 3,98,31,640.

PROPYLENE GLYCOL: From USA: Muthu Meena Agencies, 16.77 MTs., Rs. 3,95,002.

SODIUM HYDROSULPHITE: From FRG: Standard Organics Ltd., 20,000 Kgs., Rs. 4,50,440.

STEARIC ACID: From Japan: Murugappa Electronics Ltd., 150 Kgs., Rs. 19,690.

PARA TERTIARY BUTYL CYCLO HEXANE: From UK: N. Ranga Rao & Sons, 1,000 Kgs., Rs. 58,402.

TIN OXIDE: From UK: Manmohan Chemical Inds., 500 Kgs., Rs. 57,497.

TITANIUM DIOXIDE: From Japan: Addisons Paints & Chemicals Ltd., 17.500 MTs., Rs. 7,62,420; From Switzerland: Vijay Paints & Pigments Co., 220 Kgs., Rs. 19,882.

VINYL CHLORIDE: From USA: Murugappa Electronics Ltd., 522 Kgs., Rs. 36,452.

XYLENE: From USA: Addison Paints and Chemicals, 49.440 MTs., Rs. 5,76,095.

DYE MATERIALS IMPORTED MADRAS (From 18.8.89 to 24.8.89)

ALLION BLACK: From China: Carlo International, 1,000 Kgs., Rs. 50,049.

DRUG MATERIALS IMPORTED MADRAS (From 18.8.89 to 24.8.89)

MORPHOLINE: From FRG: Inventaa Chemicals Pvt. Ltd., 16,000 Kgs., Rs. 6,13,400.

SULPHADIAZINE BP 80: From FRG: Tamil Nadu Dadha Pharmaceuticals Ltd., 725 Kgs., Rs. 1,72,961.

PLASTIC MATERIALS IMPORTED MADRAS (From 18.8.89 to 24.8.89)

HDPE: From Japan: Essel Plastics and Polymers Ltd., 50 MTs., Rs. 9,53,350; SPIC., 2,04,000 Kgs., Rs. 34,21,683; Sri Rama Poly Bags, 20 MTs., Rs. 3,32,146; Sumitra Plastics Ltd., 50,000 Kgs., Rs. 7,85,984; From Saudi Arabia: Excelsior Plastics, 17,150 Kgs., Rs. 2,61,800; Sunshine Plastic Inds., 24,750 MTs., Rs. 3,61,291; From Singapore: Integrated Exports, 17,000 Kgs., Rs. 2,05,960; Ultramarine & Pigments Ltd., 68 MTs., Rs. 9,12,984; Jampex Enterprise, 119 MTs., Rs. 15,91,968; Lalith Polypacks Pvt. Ltd., 51 MTs., Rs. 6,77,088; M.V. Subramanian, 102 MTs., Rs. 13,68,972; Rabbani Impex, 45.750 MTs., Rs. 7,11,291; Shyam Textiles Pvt. Ltd., 68 MTs., Rs. 9,12,984; Vijay Plasweaves Pvt. Ltd., 51 MTs., Rs. 6,80,147; From UAE: Peacock Polymers Pvt. Ltd., 1,02.900 Kgs., Rs. 14,68,454; Indo National Ltd., 16 MTs., Rs. 2,45,573; From Canada: Samex Trading House Inc., 15 MTs., Rs. 1,99,173.

POLYPROPYLENE: From Japan: Electronic Research Ltd., 1 MT., Rs. 83,415; From Korea: ABC Corporation, 204 MTs., Rs. 22,06,556; From Singapore: ABC Corpn., 320 MTs., Rs. 31,33,922; Arun Poly Print Pack 32,000 Kgs., Rs. 4,17,090; Eskay Enterprises, 16,000 Kgs., Rs. 2,42,904; Pioneer Packaging Products, 15,000 Kgs., Rs. 2,36,482; From UK: Alsa International, 31,400 Kgs., Rs. 4,84,576.

POLYSTYRENE RESIN: From Korea: Beardsell Insulation Ltd., 34 MTs., Rs. 8,88,211

POLYSTYRENE: From Korea: Homeplast Inds. Pvt. Ltd., 17,000 Kgs., Rs. 3,38,418.

MATERIALS EXPORTED MADRAS (From 21.6.89 to 30.6.89

BARIUM CARBONATE POWDER: To Keelung: Kores India Ltd., 20,000 Kgs., Rs. 96,000.

BARIUM CARBONATE: To Keelung: Travancore Chem & Mfg. Co., 20,000 Kgs., Rs. 99,414.

BUTACHLOR TECH: To Keelung: Krishi Rasayan, 10,000 Kgs., Rs. 6,10,387.

CALCIUM SENNOSIDE 20%: To Mombasa: Kothari Phytochemicals, 300 Kgs., Rs. 70,154.

CAUSTIC SODA: To Colombo: The Mettur Chemical & Industrial Corpn., 1,27,098 Kgs., Rs. 2,08,740.

MATERIALS IMPORTED MADRAS (From 11.8.89 to 17.8.89)

N-ACETYL SULPHANIL CHLORIDE: From Japan [illegible] Labs, 20,000 Kgs., Rs. 10[illegible]

ALDEHYDE C-9/C-16: From Swit-

zerland: Mysore State Agarbathi Mfg. Co., 200 Kgs., Rs. 57,040.

ALDEHYDE C-10: From Switzerland: The Mysore State Agrabathi Mfg. Co., 200 Kgs., Rs. 32,815.

D-ALPHA PHENYL GLYCINE BASE: From China: Aurobindo Pharma Pvt. Ltd., 1,000 Kgs., Rs. 2,75,269.

5 AMINO SALICYLIC ACID: From Japan: Eskayef Ltd., 350 Kgs., Rs. 2,32,511.

CARBON BLACK: From Australia: Lotus Inks, 2,100 Kgs., Rs. 52,601.

P-CHLOROANILINE: From Japan: IEL Ltd., 2,600 Kgs., Rs. 3,04,008.

DESMOPHEN: From Belgium: Swastik Foam Pvt. Ltd., 15,480 Kgs., Rs. 2,94,408.

DIALLYL PHTHALATE: From Netherlands: Hyderabad Connectronics, 360 Kgs., Rs. 53,546.

2,6 DIETHYL ANILINE: From China: Nisshowai Corpn., 6 Kgs., Rs. 484.

N,N DIMETHYL UREA: From FRG: Associated Drug Co., 10,035 Kgs.,Rs. 4,28,638.

BETA HYDROXY ETHYL HYDRAZINE: From Netherlands: Eskayef Ltd., 6,000 Kgs., Rs. 7,85,318.

D(-) PARA HYDROXY PHENYL GLYCINE: From Singapore: Aurobindo Pharma Pvt. Ltd., 500 Kgs., Rs. 1,79,342.

LAB CHEMICALS: From USA: TB Research Centre, 6 Kgs., Rs. 6,683.

MAGNESIUM OXIDE: From UK: BMR Bactings Ltd., 500 Kgs., Rs. 15,398.

2-MERCAPTOBENZIMIDAZOLE: From Japan: Shriram Fibres Ltd., 1,600 Kgs., Rs. 2,84,529.

METHYL BETA NAPHTHYL KETONE: From Switzerland: The Mysore State Agarbathi Mfg. Co., 40

METHYL METHACRYLATE: From FRG: Addisons Paints & Chemicals, 5.04 Mts., Rs. 1,35,510.

METHYLENE CHLORIDE: From Belgium: Plant Organics, 77,760 Kgs., Rs. 7,91,220.

MONOMETHYL 2 CHLORO ACETALDEHYDE: From Austria: Indag Products, 20,800 Kgs., Rs. 14,76,167.

NEO PENTYL GLYCOL: From Japan: Vorin Laboratories, 30,000 Kgs., Rs. 7,05,438.

5 NITRO 2 FURFURALDEHYDE DIACETATE: From Netherlands: Eskayef, 8,250 Kgs., Rs. 4,20,216.

POLYETHYLENE GLYCOL: From USA: Parke Davis India Ltd., 100 Kgs., Rs. 23,283.

POLYVINYL ALCOHOL: From Japan: Saroj Chemical Inds., 2,000 MTs., Rs. 95,371.

PROPYLENE GLYCOL: From USA: Reichhold Chemicals, 16.616 MTs., Rs. 3,65,910.

PYRIDINE: From Japan: Plant Organics Ltd., 3,315 Kgs., Rs. 2,25,447.

SODIUM BOROHYDRIDE: From FRG: Kothari Phytochemicals, 1.8 Kgs., Rs. 49.

THIOUREA: From Japan: IEL Ltd., 7 MTs., Rs. 2,33,562.

TITANIUM DIOXIDE: From Switzerland: Vijay Paints & Pigments, 390 Kgs., Rs. 25,247.

TRICHLOROSALICYLIC ACID: From UK: IEL Ltd., 6,030 Kgs., Rs. 15,39,548.

TRIETHYLENE GLYCOL: From Singapore: Daneri Electric, 940 Kgs., Rs. 44,378.

TRIMETHOXY BENZALDEHYDE: From Japan: Coastal Pharma Chemicals, 1,500 Kgs., Rs. 5,88,575.

3,4,5 TRIMETHOXY BENZALDEHYDE: From Japan: Standard Organics Ltd., 3,00 Kgs., Rs. 12,48,843.

TRIMETHOXY BENZALDEHYDE: From Netherlands: Inventaa Chemicals, 6,300 Kgs., Rs. 24,21,595.

ZINC CYANAMIDE: From UK: IEL Ltd., 2,640 Kgs., Rs. 2,77,992.

DRUG MATERIALS IMPORTED MADRAS (From 11.8.89 to 17.8.89)

HYDRO CORTISONE ACETATE BP: From Netherlands: Eskayef Ltd., 10 Kgs., Rs. 1,01,138.

INDOMETHACIN BP: From China: Tamil Nadu Dadha Pharmls., 400 Kgs., Rs. 2,21,216.

PLASTIC MATERIALS IMPORTED MADRAS (From 11.8.89 to 17.8.89)

HDPE: From Japan: Bharat Trading Corpn., 16 MTs., Rs. 2,40,373; Chitra Polypack Industries, 40 MTs., Rs. 6,24,927; Hyderabad Polymers, 60,000 Kgs., Rs. 9,68,764; Reliance Plastic Inds., 15 MTs., Rs. 2,60,212; STC., 1,00,000 Kgs., Rs. 16,76,703; From Portugal: Digvijay Polytex, 16.5 MTs., Rs. 2,84,126; From Singapore: Amman Polysacks, 17.5 MTs., Rs. 2,33,589; Integrated Exports, 71,025 Kgs., Rs. 9,54,251; Jampex Enterprises, 122 MTs., Rs. 13,64,592; Lucky Gold Star Packings, 17,000 Kgs., Rs. 2,53,876; Ramani Impex, 17 MTs., Rs. 2,25,696.

HDPE: From Singapore: Shelliya Plastic Industry 51 MTs., Rs. 6,85,139; Shyam Textiles, 34,000 Kgs., Rs. 4,56,492; Super Polytex Ltd., 34 MTs., Rs. 4,53,776; Suvarna Polysacks Pvt. Ltd., 34,000 Kgs., Rs. 4,64,335; Venkateswara Chemicals, 8.25 MTs., Rs. 1,10,108; Dass Inds., 17,500 Kgs., Rs. 2,75,841; Rabbani Exports, 40 MTs., Rs. 5,22,875.

LDPE: From Singapore: ABC Corporation, 340 MTs., Rs. 3,29,658.

POLYTETRAFLUOROETHYLENE: From Japan: Thermo Plastics, 400 Kgs., Rs. 96,762.

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The name Citurgia is today synonymous with Citric Acid of the finest quality.

Citurgia caters to more than just one need in more than just one industry. Besides the traditional usage of Citric Acid in food, soft drinks, confectionery and drugs, today the uses of Citric Acid extend to new areas:

- In the textile printing and dyeing industry it provides 'STABLE pH' conditions for polyester and nylon. As also for acrylic prints curing and cotton-resist printing. Citric Acid has successfully replaced imported Tartaric Acid because of its excellent quality, low costs and easy availability. Also, it is a very safe acid compared to other organic and inorganic acid salts.
- Citric Acid prevents flavour deterioration, rancidity and discoloration in edible oils.
- It imparts an acidic taste to dry powdered drinks.
- It is also used as a descaling solution.

Citurgia Biochemicals Ltd. is the largest producer of high quality Citric Acid in India. Besides catering to the domestic demand, Citurgia's Citric Acid is exported to USA, Japan, Germany, Australia, Iran, Malaysia, Sri Lanka and other countries.

Citurgia Citric Acid-India's No. 1

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